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Plastic Products

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by John McE. Sanderson

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by D. A. Dearle

Pentaerythrite Resins
by Dr. S. Malowan

Applications of the Flow Tester
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April 1934

VOLUME X NUMBER 4

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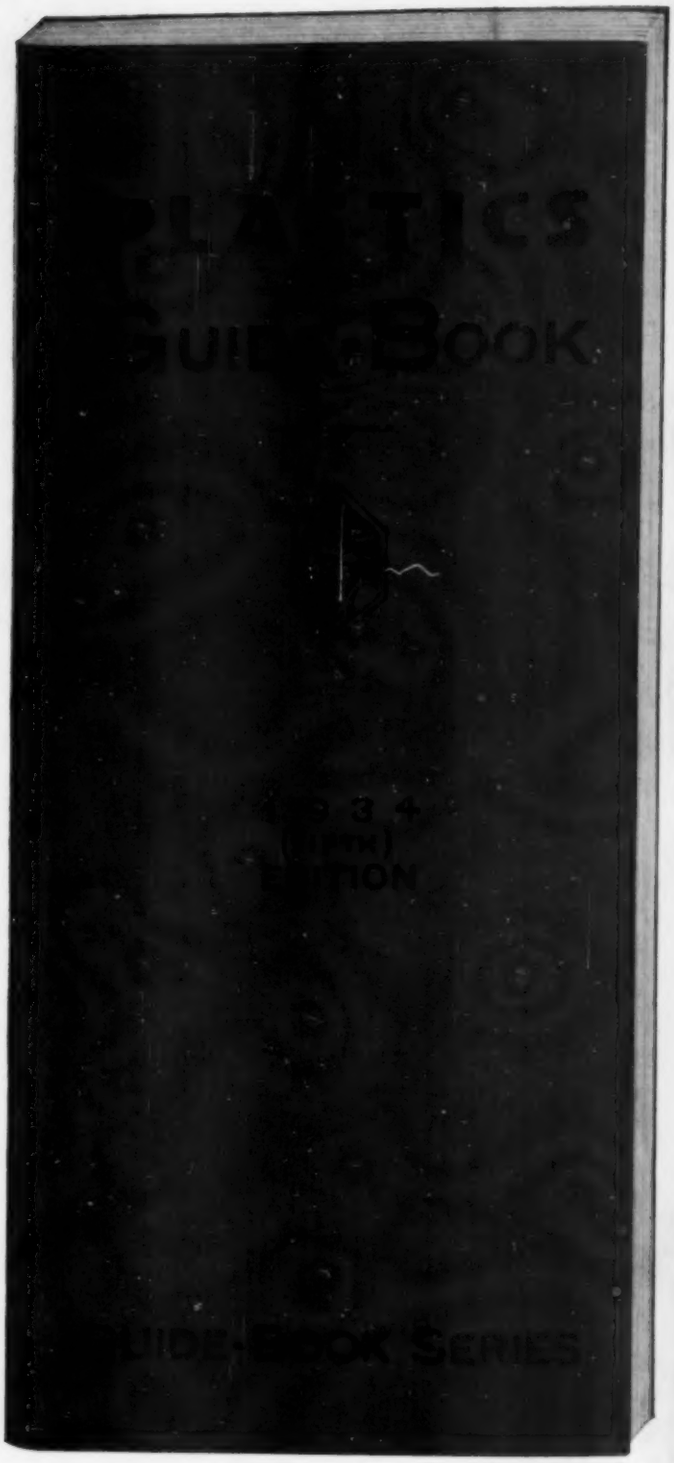

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Plastic Products

Contents April 1934

Cover—Coated Wall Covering
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Adapting the Press to the Mold
By D. A. Dearle 130

Applications of the Flow Tester
By Gilbert L. Peakes 132

A Series on Solvents and Plasticizers
By Dr. William M. Grosvenor 136

Industrial Coatings Department

Alkyd Resins in Coatings
By John McE. Sanderson 141

Pentaerythrite Resins
By Dr. S. Malowan 147

Plastics and Coating News 149

Plastic Patents 159

Indexed in the Industrial Arts Index and the Engineering Index Service

Volume X **Number 4**

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Plastic Products

VOLUME X NUMBER 4

Excuse or Explanation

THE grass in the neighboring field is proverbially greener; but neither an excess of envy nor a lack of patriotism inspires the inquiry into conditions in the British plastics industries which a number of our leading executives have recently been conducting. Their independent conclusions are unanimous and definitive.

Although our experience is older and our technique still somewhat in advance, and despite the fact that our production is greater and our market more varied, nevertheless British profits are proportionately greater and what might be summed up as "the state of trade" much more satisfactory. All those familiar with conditions in these industries in both countries agree upon these facts.

We are still enjoying the initial advantages of the pioneer. Not only were the first important pyroxylin and phenolic plastics American inventions; but the molded wares, the lacquers and the coated fabrics were all first commercially exploited upon a large scale in this country. On the other hand, while competition is quite as keen in England, nevertheless it is better organized and not so centered upon prices.

Plainly there is something radically wrong with our stock excuse for the demoralized condition of our industry on the grounds of youth and rapid growth. Moreover, the glib explanation that more stable conditions in England are the result of the splendid work the plastic trade association has done hardly seems to go far enough.

Most of our leaders know of this fine co-operative effort which has done so much not only within the British industry, but also by exhibits, lectures, radio talks, and printed propaganda so successfully "sold" plastics to the British public, and we have all indulged in a lot of wishful thinking about what such an organization might do for us. The plain fact is that the British have such an organization because they have industrial leadership with vision enough to see that what is for the broad good of all plastic products is more important than what is to the narrow advantage of their own company.

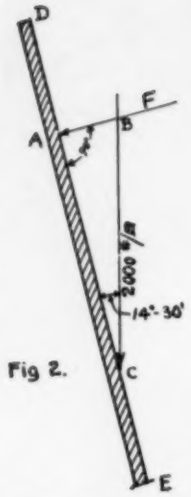


Fig 2.

Adapting the Press to the Mold

By D. A. Dearle

IN THE rapid growth of the molding industry many problems which really need research have been passed over without a great deal of thought and in many cases guesswork has been substituted for serious study. In their anxiety to get sales, most factory managers take for granted some of these same finer points that do arise in the average molding plant from day to day, but the time has come when greater efficiency is an absolute necessity to cope with ever increasing competition. Any short cuts realized will be a means of eliminating unnecessary expense.

Considerable experimenting has been carried on in deciding the size of press to be used for every new piece of work that is sent into the plant. Practical, workaday knowledge of what has worked in the past is, however, the common basis for the selection of the press to be used. Many times the molder is fortunate at the outset. But if his guess is not always right he wastes a great deal of time shifting the die from one press to another. He finally finds the one adaptable to the job, but all this additional labor of "setting up" requires the time of valuable men and should be avoided. This problem of deciding accurately the exact press to be used is really quite simple and, regardless of design of the die, requires little time to determine. Let us analyze it from a technical standpoint.

In the first place we know that the desired molding pressure is in the vicinity of two thousand pounds to the square inch. At least, this figure is close enough to use as a basis for calculations. We realize, too, that the two thousand pounds is acting in a vertical direction, but we have not taken into consideration the side pressure, or in other words, the force exerted on a piece with straight or slanting sides. Will it take the same pressure, for instance, to mold a 2″ disc ⅛″ thick as it will a tumbler about 4″ deep with a 2″ diameter on the bottom? Will a fifteen cavity coaster mold require the same size of press as a fifteen cavity tumbler mold if the diameter of the coaster is coincident with the base of the tumbler? Of course we can give a rule o'thumb answer to these questions, but that is not enough. Our problem is to determine the amount of this side pressure and to what measure it affects the size of press that should be used.

For illustration let us use the above example, that is, a fifteen cavity coaster mold or disc 2″ in diameter assuming there are to be no vertical sides. The area of a 2″ disc is 3.14 sq. in., so the total net area for fifteen cavities would be 47.12 sq. in. Adding a land area of ½″ to each diameter brings the total or gross area to approximately 73.63 sq. in. According to theory and present practice a 75 ton press would suffice and a 10″ ram would undoubtedly close the mold satisfactorily.

Let us now turn our attention to the other item, namely, the molded tumbler, (see Fig. 1). For reasons of simplification we are assuming the bottom of this tumbler to be 2″ in diameter and the height to be 4″. For further purpose of easy calculation let us assume the angle of the sides to be 14°-30′ to the perpendicular. The natural sine of this angle is .25010. Using these dimensions we have a periphery with an average diameter of 3″ and the side area amounts to roughly 37.7 sq. in. for each tumbler. Fifteen cavities would therefore involve an additional area of 565.5 sq. in. Were this area in a horizontal plane instead of in a position very nearly perpendicular to the horizontal, it would necessitate a 570 ton press, or a ram size of almost 30″ in diameter to close it. Knowing the area to be at an angle of given magnitude with the vertical, however, it is a simple matter to determine the actual force required to offset this oblique surface. Let us look at Fig. 2. Here we have a graphical representation of the forces exerted on the side walls of the tumbler. We know one angle and one side in the triangle ABC and inasmuch as F is at right angles to the surface D-E the value of this force is obtained from the following equations:

$$F = 2000 \text{ (sin } 14°\text{-}30')$$

$$\sin 14°\text{-}30' = .25010$$

$$\therefore F = 500 \text{ lbs. per sq. in.}$$

The total area on which this force of 500 pounds acts was found to be 565.5 sq. in., so this becomes equivalent to about 141.4 sq. in. on which one ton must act. This is not all, though, inasmuch as we have not taken into consideration the land area for our semi-positive, nor have we added in the horizontal areas of the bottom. This additional land area, using the same figure as we did before, is more than in the case of the disc on account of the larger diameter at the top of the tumbler. The maximum diameter is 4″ and with an additional ¼″ for fifteen cavities we

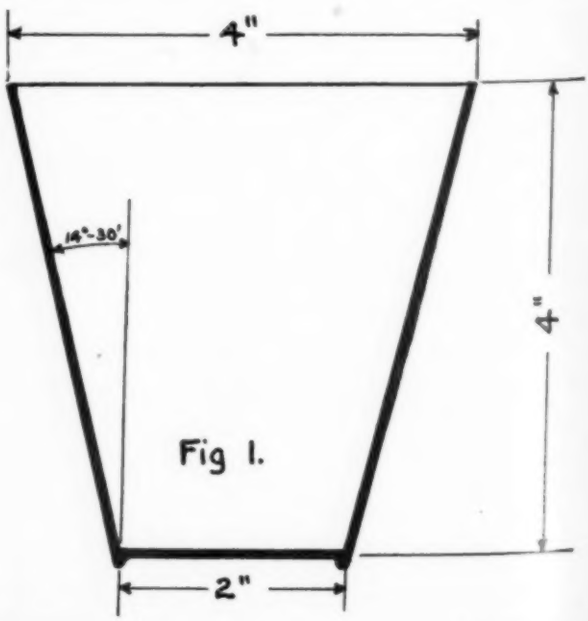


Fig 1.

have approximately 24.3 sq. in. more which have to be considered.

In summing up the figures we find 141.4 sq. in. for the side area on which 2000 pounds must act, in addition to the 24.3 sq. in. for total land area, and 47.13 sq. in. for the bottoms. This gives us a total of 212.8 sq. in. and would therefore require a press with a minimum capacity of 213 tons. The corresponding ram size is found to be about 17″ in diameter, which means that an 18″ ram press would be required to mold the pieces most efficiently.

From comparison of figures one can readily observe the need of carefully considering side walls and oblique surfaces when computing mold and press capacity. This example, for instance, indicates that a press with a ram size almost twice that of a disc would be required to mold tumblers having the same diameter on the bottom as that of a disc with no vertical sides. Of course it should be noted that the mean diameter of the tumbler used in this illustration is 1″ in excess of the disc, but the necessity for careful calculation when side surfaces are involved is obvious.

A general formula to apply to any design of piece may be easily deduced from the equations above outlined. If we let A_s represent the total area of surfaces not in the horizontal plane, and call Y the angle which these surfaces make with the vertical, then T, the additional tonnage required can be determined by the simple equation $T = A_s \sin Y$.

One very important feature has been purposely omitted from our calculations, i. e., frictional resistance. The force of friction along the sides is something that most certainly enters into the problem, but inasmuch as this force is a variable and differs for each molding powder on the market, it is better to disregard it for the time being. What the coefficient of friction is for the numerous materials is another problem which requires exhaustive research.

It is evident that any such figure when determined for even one type of powder alone must still be a variable depending upon numerous factors such as temperature, resin content, ram pressure, etc. Whenever such tables are available we shall then be able to determine with even greater accuracy the size of press required for each respective die. For the time being, however, the application of a certain factor of safety to allow for the omission of this feature will definitely insure us against error and subsequent loss of valuable time.

Plastics for Safety Glass

Synthetic resins are enjoying increasing popularity as adhesives and central sheets in safety glass; in addition to their high adhesive power they are clear and transparent. Phenol-formaldehyde resins have the disadvantage of turning dark-colored.

In using phenol-formaldehyde plastics, glass polished with emery is used; a 60 to 80 per cent. solution in a suitable solvent is applied to the glass, acetone or alcohol being used as the solvent. The solution being thick it must be spread with a spatula and a temperature of 30 to 40° C. is satisfactory. Heating to 80° C. removes the solvent and a thin layer of resin remains. The treated glass plates are then pressed together at 150° C. and five atmospheres pressure, the process requiring about a day. The adhesion of the cemented glass plates is very great. Although the adhesive layer is at first clear and colorless, unfortunately it darkens in the course of time. To save solvent, the resin may be applied as a liquid (by melting), polymerization being caused by the application of heat. These synthetic resins may be combined with cellulose derivatives, the adhesive power being greatly increased.

However, many synthetic plastics do not darken. Among them are urea resins which are used in the same way as the phenolic products. A catalyst is added to accelerate the condensation. Moreover, urea and thiourea are cheaper and fast to light. Thickness of the resin layer may be varied according to the requirements of the glass, by using more or fewer layers; in this way, the more expensive solvents and cellulose sheets may be dispensed with. In fact, safety glass giving good security against flying splinters can be made from a single layer of glass coated with the synthetic resin.

In place of urea resins, good results may be obtained from the use of toluenesulfonamide-formaldehyde resins, particularly p-toluenesulfonamide. The adhesive layer made of this product is even more stable than those previously mentioned. Above all, it is resistant to ultra-violet light; the resins are clear and transparent to light of all wave-lengths. The products may be used alone or in combination with cellulose derivatives to obtain durability, stability and protection from glass splinters.

To prepare safety glass from this resin, 50g. are dissolved in a satisfactory solvent, such as acetone, and the solution painted on glass plates. After a short period of drying, the prepared plates are pressed together under raised temperatures and pressure.

When cellulose derivatives are also employed 25g. low viscosity nitrocellulose and 50g. p-toluenesulfonamide resin are dissolved in 120g. acetone. This solution is spread on glass plates, dried for a short time and then plates are pressed together under heat. Acetylcellulose may be used in place of nitrocellulose with a suitable solvent. The synthetic resin may also be spread upon the plates in a semi-liquid state, saving solvent.

Aniline-furfural and glycol-phthalic acid resins may also be used. The adhesive power of these resins is excellent and they do not darken.

Finally, we must mention the condensation product of maleic anhydride and organic hydroxy compounds, especially dibasic alcohols. This substance may also be combined with cellulose derivatives. We must also consider the various polymerization products used for safety glass. Styrol, in various stages of polymerization, may be used. In fact, a safety glass may be made without the use of glass: several layers of styrol polymers are used, inner layers being hard and outer ones somewhat softer, to cause pressure equalization. Styrol or its homologs, such as ethyl or methyl styrol, may be used; polymerization occurs at elevated temperatures. Heating a 40 per cent. styrol solution to 118° C. generates a relatively hard substance, while heating to 140° C. gives rise to a brittle product.

Vinyl compounds, especially the esters, are more important than styrol. Cellulose derivatives should always be used in combination with vinyl compounds to increase adhesive power. The glass plates are coated with a nitrocellulose solution and a 50 per cent. vinyl solution; press together under slight pressure. Chlorbenzene is a serviceable solvent.

Polyvinyl acetate may be used as a powder, when it is melted on the glass plate. After melting and slight drying, the plates are pressed together.

Esters of itaconic, acrylic, cinnamic and crotonic acids may also be used to give polymerization products. The ester serves as the adhesive while a cellulose derivative gives strength to the sheet. Thus itaconic esters, in the absence of anti-catalysts such as alkalies, are converted into a thick liquid. Complete polymerization takes place between glass plates after longer heating at 70° C. A small quantity of accelerator should be added to the mixture and alkali must be rigidly excluded. About 0.1 per cent. of itaconic acid itself is a good accelerator. The polymerization of the ester requires a relatively long time.

Even more important are the polymerization products of the acrylic acid series. With these substances, other additions are not required. A solution of the ethyl ester of acrylic acid is poured upon the glass plates to form a layer about 4 mm. thick; the plates are then pressed together at 90° C. Different durations of polymerization give products of varying properties.

These individual polymers may be mixed with each other, particularly with cinnamic and crotonic acid esters. In this way, glass plates may be permanently united. Bubbles may be removed by slight pressure and only low pressures need be used for cementing the glass plates together. The polymerized layer is clear, transparent and permanently resistant to atmospheric influences.—*"Kunstoffe"*.

Applications of the "Flow Tester" to Commercial Work

By Gilbert L. Peakes
Bakelite Corporation

IN THE first two articles of this series, the "flow tester" and the test information which it provides were described. In this final article its applications are demonstrated.

Mold Poisoning

Many instances have been noted in molding plants of molds being "poisoned". The ordinary staining, in which materials will produce discoloration of the bright steel surfaces of the same color and in the same order as in heat tempering, passing gradually through pale straw, deep straw, light blue and deep blue to black, is not what is referred to. The phenomenon seems to be an invisible stain, temporary in character, which is not known to have been directly seen or identified in any way, but which shows itself by causing various degrees of seizing or sticking of a certain material when that material has been preceded in the mold by a number of cycles of a certain other material. This effect has been noted in many instances involving quite a large variety of compounds, and has been found not only between compounds made by different manufacturers but between different compounds of the same manufacturer. Just as no one has seen this stain, so no one has ever devised a reliable method of removing it, except by continuing to mold the second material under difficulties until it has worn off the "poison". The flow tester affords a comparatively sensitive method of approximately rating the tendency of various materials to poison one another. While the test does not in any case measure sticking directly, the flow distance obtained is much affected by the condition of the surface in the flow-tube of the cone. Once the rod of flowing material has been formed at the entrance to the flow tube, it is then pushed over the tube surface under pressure, and any visible roughness or invisible stain is capable of directly retarding the flow.

For example, at a pressure of 275 lbs. per sq. in. and temperature of 150° C., sample G gave the flow distances of Table III, in the order shown.

Table III

Sample G

Pressure 275 lbs. per sq. in.
Temperature 150° C.

1.32	1.30
1.34	1.31
1.31	1.30
1.32	1.30
1.31	1.31
1.30	1.30

This record was begun only after running sufficient preliminary tests to insure removing the effect of previous material. Immediately following the 12 tests of sample G, sample H was run at 150° C. and 600 lbs. per sq. in. pressure. The pressure was chosen so as to give a flow distance which would not overrun the part of the tube affected with poisoning from sample G. The results from this sample were in the order shown by Table IV.

Table IV

Sample H

Pressure 600 lbs. per sq. in.
Temperature 150° C.

.96	1.10
.97	1.18
.99	1.18
.93	1.18
1.07	1.15
1.04	1.18
1.04	1.18
1.04	1.19
1.01	1.18
1.01	1.20
1.04	1.20
1.05	1.20
1.09	1.21
1.10	1.20
1.11	1.20
1.12	1.21
1.10	1.22
1.15	1.21
1.16	1.20
1.15	1.20
1.18	1.20

By plotting the 42 tests on sample H, the indicated range from first test to final steady value is from .95" to 1.20".

Immediately after these tests sample G was run again at 150° C. but at a lower pressure than before, 175 lbs. per sq. in., chosen so as to give a flow distance which would not overrun the part of the tube affected with poisoning from sample H. The results are given in Table V.

This time a plot indicates the flow range to be approximately from .76" down to .60", while the poison is being worn off the tube.

Thus it is shown that, as in life, "one man's meat is another man's poison." Sample G poisons sample H to the extent of reducing its flow .25" *below* where it should test at 1.20", while sample H in turn, feeds sample G by increasing its flow .16" *above* where it should test at .60".

It is necessary in the routine operation of any plasticity test, more especially a sensitive one like the flow tester, to watch out for tests which may be made inaccurate by mold poisoning.

Table V

Sample G

Pressure 175 lbs. per sq. in.
Temperature 150° C.

.78	.65
.71	.65
.70	.65
.68	.63
.70	.62
.73	.60
.75	.60
.73	.59
.70	.60
.73	.60
.68	.60
.68	.60
.69	.60
.65	.60
.68	.60
.67	.60

Mold Lubrication and Polishing

It has been shown that some invisible effect on the mold surface may affect the flow of compound through the cone of the flow tester. It is also true that the mold surface itself may be directly lubricated by waxes, oils, or other substances used for lubrication, the overall effect being usually to increase the apparent softness of the material being tested. For example, using sample I, a temperature of 150° C. and pressure of 500 lbs. per sq. in., a series of distance tests was run, getting the usual slight variation around a constant average distance of .60". The flow tube of the cone was then lubricated with beeswax just before each test with results indicated in Table VI.

Table VI

Sample I

Pressure 500 lbs. per sq. in.
Temperature 150° C.
Original unwaxed average
.60
Waxing for each test

.85	1.29
1.00	1.29
.97	1.23
.93	1.23
1.02	1.23
1.20	1.22
1.20	1.22

At this point waxing ceased but molding continued. The effect of the wax was persistent, and 58 tests were required before the operator was assured that flow had returned to its normal value of .60".

The same procedure was repeated, with a similar result, that the flow distance gradually built up to a maximum value substantially above the normal figure. By washing the wax off the cone with alcohol at the end of the waxing series, it was found that flow had returned to normal on the first test after washing.

The effect of lubricating the flow tube with various other substances was also tried. An anti-rust slushing grease was found to give extremely uniform flow distances, much increased over normal.

The effect of using polish on a mold may also be indicated by the flow tester. The flow tube was carefully and thoroughly rubbed with a liquid metal polish, and wiped off as completely as possible with a clean rag. Table VII shows the distances of flow which were obtained at 250 lbs. per sq. in. and 150° C. using sample J.

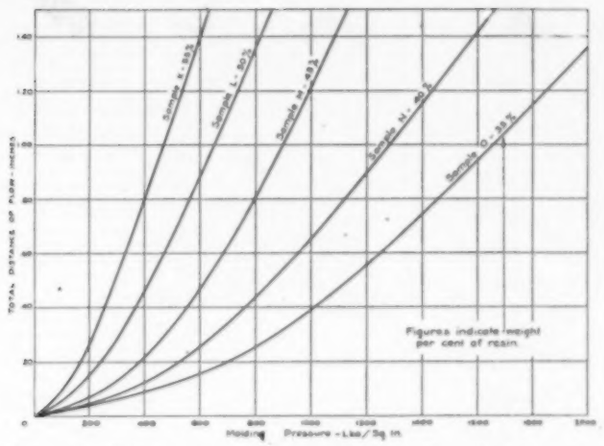


Figure 15. Distance-pressure curves showing effect of resin content (temp. 150° C.).

Table VII

Sample J

Pressure 250 lbs. per sq. in.
Temperature 150° C.

.50	1.08
.67	1.13
.87	1.12
1.01	1.13
1.09	1.11
1.10	

The poisoning from this polish is just as invisible as the poisoning produced by sample G, but the conclusion should not be drawn that all polishes will reduce flow in a similar manner. It is well known, however, that new molds which, of course, are polished as the final machining operation, require breaking in, and are liable to sticking at first.

Plasticity Control

General practice in the molding industry has tended toward a resin content of around 45% to 55% by weight for general-purpose molding compounds using all-woodflour filler. The resin content may, however, be varied substantially while still giving a moldable and fairly presentable compound. As illustrative of the effect of varying resin content the distance-pressure characteristics of Fig. 15 may be cited, representing the same ingredients made up in resin contents varying from 35% to 55% in steps of 5%. The differences in plasticity are large, but still not substantially larger than may be occasioned by other variables such as type of resin, softness of resin, time or temperature of compounding, etc., so that it will be evident that although the flow tester is useful in measuring flow characteristics, its results may not be used to indicate resin content.

Effect of Moisture

Manufacturers of molding compounds have all experienced customer's trouble calls involving excess moisture in the compound. Compound, in the form of powder especially, but also in the form of tablets, will very rapidly take up from moist atmosphere sufficient moisture to affect the flow, the molding performance, the appearance, and the mechanical and electrical properties of the finished piece. On a normal type of woodflour compound, sample P, the following flow experience should be illuminating. Standard flow-tester tablets were made, which at 500 lbs. pressure and 150° C. showed a flow of .76". The sample was suspected of being wet. Three hours in a desiccator reduced the flow of these tablets to .21", and 23 hours to .10". Following this treatment the remaining tablets were removed

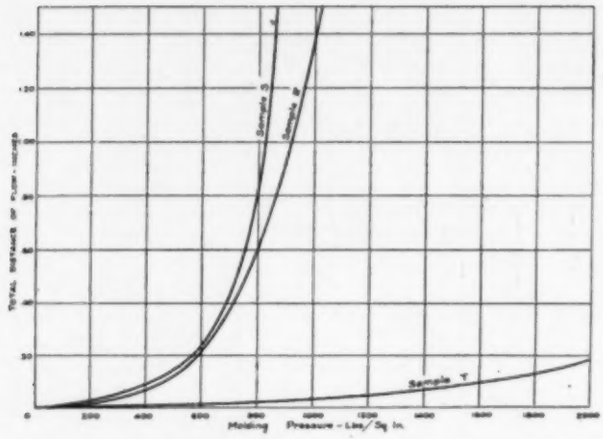


Figure 16. Distance-pressure curves showing variety of urea molding compounds (temp. 150° C.).

from the desiccator and allowed to stand near an open window on a foggy day, but protected against direct drafts from the window. This treatment raised the flow in 15 minutes from .10" to .20", in one hour to .57", and in 1¼ hours to .78". In view of the rapidity with which tablets can take on moisture under favorable conditions, it is obvious that care must be used if the original molding qualities are to be maintained while molding in damp or rainy weather.

It is usually appreciated that excess moisture in a molding compound or in organic materials in general, will give poor electrical properties, manifested in the form of high power factor, low insulation resistance, and low dielectric strength. It is perhaps not so well appreciated that excess moisture in molding compound may appreciably affect the surface appearance and shrinkage, as well as the plasticity.

As an example of what may happen a certain customer complaint is typical. The report came in that material, which according to the manufacturer's test should have been all right at the customer's plant, was blistering badly on the standard molding cycle. In the molder's plant it was customary to make up enough tablets ahead of the presses to run several days in case of tablet machine breakdown. This policy was carried out even in humid summer weather without any moisture-protection for the tablets. Some of his tablets, stored in open containers, were reground and compared on the flow tester with the original sample, which had been kept sealed in a metal container, with results as shown in Table VIII.

Table VIII

	Moisture %	*Flow Distance at 500 and 150° C.*
Original powder kept sealed	2.32	.37"
Tablets exposed by customer	4.56	.97"

On the above finding, a further and more definite checkup was made, using a different lot of compound. Checks were made of minimum curing time on the job in question, as well as moisture content and softness, using samples specially prepared. The special preparation consisted of making up a lot of tablets which was divided into 4 parts, one tested immediately, one sealed into a metal container, one left exposed to the atmosphere of the molding shop, and the fourth exposed in a closed space to 85% humidity at 100° F. After 40 hours the latter three samples were tested, with results as given by Table IX.

Table IX

	Moisture	*Flow Distance*	*Minimum Cure*
Original	2.40%	.62"	98 sec.
Sealed	2.48%	.68"	98 "
Ordinary Exposure	2.92%	.82"	105 "
Humidity Exposure	6.46%	1.37"	over 120 "

Examination of the molded pieces disclosed further that the excellent surface of the original material had been maintained while sealed up, but had been noticeably affected by ordinary exposure and completely ruined by the humidification. The "ordinary exposure" occurred during clear mid-summer weather of comparatively low humidity, and the "humidity exposure" was not far from that which frequently occurs in molding shops due to steam and water leaks.

As an example of the correlation between plasticity, moisture, and electrical properties, sample Q, a general-purpose woodflour material was chosen. Portions of this sample were exposed for 144 hrs. to relative humidities of 10, 40 and 70% at room temperature. The powder samples were then tested directly for flow distance on the flow tester, and for moisture content by vacuum desiccator. Other portions were molded into plain discs 5 inches diameter by ⅛ inch thick. On these discs tests of power factor at 1000 cycles, and dielectric strength at 60 cycles were made. The various values for the three conditions were as shown in Table X.

Table X

Relative Humidity—%	10	40	70
Moisture Content—%	1.05	2.23	4.02
Flow Distance at 1000 lbs. 150° C.— inches	.80	1.01	1.29
Pressure to Flow 1.00" at 150° C. lbs. per sq. in.	1200	990	750
Power factor 1000 cyc.—%	4.9	6.1	37.0
Dielectric Strength at 60 cyc. instantaneous V. P. M.	348	398	321
Dielectric Strength at 60 cyc. minute V. P. M.	325	340	212
Drop in dielectric strength from instantaneous to minute values—%	6.6	14.5	34.0

The table shows definitely the effect of moisture in increasing softness, decreasing dielectric strength, and increasing power factor. It is interesting also to note the fact that as the moisture content increases, the relative drop from instantaneous to minute dielectric values also increases. This means that when compound has defectively low dielectric strength due to excess moisture, the defect will be much more readily caught by the minute test than by the instantaneous test.

Another feature of interest is that the dielectric strength by both methods is lower for the 10% humidity than for the 40% humidity, in spite of the fact that the usual trend of thought is, "the drier the better." In the case of molding compounds, however, as these figures from the flow tester show, a very dry compound is relatively stiff, and therefore under the same molding pressure the particles will be less firmly cemented together.

The above comments on moisture have digressed somewhat from the subject of flow or plasticity testing, in order to suggest correlation in the reader's mind between the story given by the flow tester in regard to moisture, and the story given by other tests with which he may be already familiar.

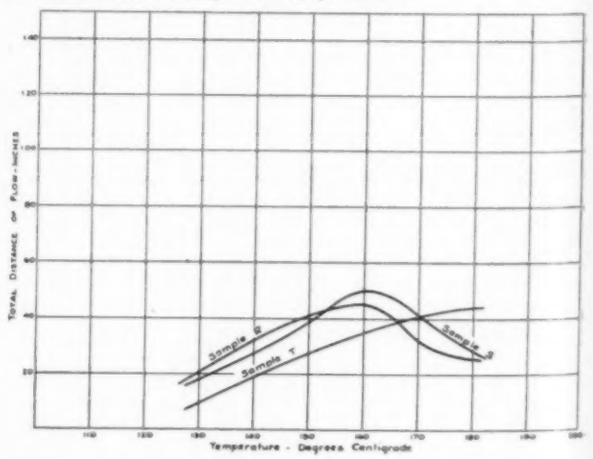


Figure 17. Distance-temperature curves showing variety of urea molding compounds.

Urea Compounds

In the molding industry at the present time, there are, in addition to the manufacturers working with phenolic resins exclusively, several who manufacture urea resin and molding compounds. The plastic properties of such materials, as measured on the flow tester, are undoubtedly of interest in comparison with the phenolic types. In Figs. 16 and 17 are shown the characteristics with respect to pressure and temperature of 3 different samples R, S, and T of urea compound from as many manufacturers.

Conclusion

In the above notes the principles back of the design of this plasticity testing device, and the type of information which may be obtained with it, have been explained. Some of the applications of these test methods to the everyday problems of manufacture and test of hot-molding compound have also been discussed. It has been found during the development and extended trial of this type of testing device, that various improvements in both design and manipulation could be made. The experience to date has also demonstrated further that there are improvements still to be made, and it is expected that work now under way will accomplish some of them. It has been found also that the flow tester will not in every case predict what the actual commercial performance of a material will be. It has, however, proved of excellent value in many cases.

Synthetic Resins Enter Cotton Goods Field

We have become a bit blase and it is difficult to startle many in the plastics industry by a new use. We are quite accustomed to finding plastic materials replacing almost anything from an iron pot to a diamond earring, and we know very well that almost any property from dielectric strength to acid resistance may be found within the range of plastic materials. Nevertheless to find that it is a synthetic resin which is the basis of the new creaseless cotton fabrics does cause more than a passing interest.

Within textile circles the recently perfected Tootal Broadhurst process of rendering cotton goods practically creaseproof has been widely recognized as a truly revolutionary development; a type of progress fundamentally new and holding all sorts of interesting possibilities. The process was developed as the result of a very carefully planned research aimed definitely at this specific end.

It was early realized that there are at least two methods of attacking the creasing problem. One is to fill the spongy cotton hairs with some elastic substance: another is to combine with the cotton some substances which would eliminate its plastic nature and give it the necessary resilience. Both methods were tried and finally the introduction of synthetic resins into the fibre proved successful, though only after some years of work had shown the way to retain all the other textile qualities of cotton when it was impregnated with resin. To be suitable for this purpose, the synthetic resin molecules should be small during the impregnation of the fabrics so as to enter the cotton hairs. The substances used must not damage the fabric nor must resinification by heat or otherwise be effected under conditions which damage the fabric. Furthermore, the resin must be colorless and not discolored by strong sunlight; it must be elastic so as to give the anti-creasing properties, and must be introduced without impairing the suppleness of the fabric. It must also withstand laundry treatment.

These conditions considerably limited the types of resin which could be used. Further investigation showed that when the resin was mainly inside the cotton hairs a soft fabric was obtained, but when a considerable amount of resin was left between the hairs and the yarns, the cloth was hard and stiff. The microscopic examination also showed that the diameter of the cotton hairs is permanently increased, causing the fabric to give better cover, and the treatment accordingly must be directed towards getting rid of all the resin between the fibres. By treating cotton and rayon fabrics in this way, effecting final condensation after the resin solution was put on the cloth, remarkable anti-creasing properties were conferred. In addition, shrinkage by washing was reduced while the strength of rayon was increased by 30 per cent. when dry and up to 100 per cent. when wet.

The next stage of development, from the laboratory to a manufacturing scale, proved difficult as well as costly. In addition to mechanical difficulties, physical and chemical methods of control at each stage of the process had to be elaborated. Not merely the design of suitable machinery, but also the development of suitable testing methods for accurate control made demands on a combination of engineering, chemical and physical knowledge which the man with a general training was often better able to meet than a highly specialized research worker.

One of the major difficulties was concerned with an apparatus for converting the resin inside the cotton hair into insoluble form. This had to be done by running a continuous length of cloth through a machine capable of heating it evenly over its width for a short time to a high temperature. Finally an electrical method was selected, which was novel in the electrical trade, and with this machine a production of some thousands of yards sufficed to gain the experience for the design of full scale plant in which weakness of design and lack of robustness in various details were eliminated.—*Abstracted from Nature.*

Effect of Equipment on Condensation of Plastics

Large scale condensation of synthetic resins frequently gives different results from those observed in the laboratory; investigation shows that the type of material used in the construction of the apparatus has a definite effect upon the product. Especially striking is the fact that condensation requires a much longer time in aluminum vessels than in glass usually used in the laboratory.

In an exhaustive investigation, the resin was prepared from phenol and a 40 per cent. aqueous solution of formaldehyde; a small quantity of an acid served as a catalyst. The condensation was carried out in glass vessels, but metal strips were immersed in the mixture to be condensed. Results appear in the following table:

Metal	*Time of Condensation*	*Color of Product*
None	55 minutes	Water-clear, very slightly cloudy
Pure Nickel	85 minutes	Glass-clear, slight yellow tinge
V2AE/3B Steel	70 minutes	Glass-clear, dark yellow
Pure Aluminum	145 minutes	Yellow, cloudy-clear
Silumin	240 minutes	Yellow, cloudy-clear

With reference to the color of the product the sequence is as follows: 1. Glass without metal; 2. Pure nickel; 3. Silumin and pure aluminum; 4. V2AE/3B Krupp steel.

According to the time required for condensation, the sequence is: 1. Glass alone; 2. V2AE/3B steel; 3. Pure nickel; 4. Pure aluminum; 5. Silumin.

Since condensation takes place in apparatus equipped with a reflux condenser, the effect of metals hung in the condenser, not in direct contact with the condensation mixture, was tested. In this case, metals are substantially without effect upon color and the time required for condensation.

Aromatic Amine-formaldehyde Resins

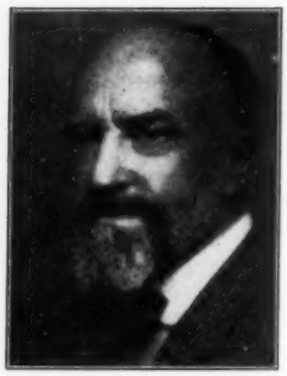
Condensation of aromatic amines such as aniline with formaldehyde illustrates a class of heat-hardening resin now being developed industrially for the production of laminated materials for electrical purposes. Amorphous materials produced from these condensations have long been known, but only in recent years has their commercial exploitation been found practicable. A related resin is obtained from toluene-*p*-sulfonamide and formaldehyde which is light in color and has plasticizing properties.

A SERIES—

To appear monthly in each issue through August on the properties of Solvents and Plasticizers

By Dr. William M. Grosvenor

Dr. Grosvenor, head of the Grosvenor Laboratories, has devoted his career to chemical and plastic developments, and a few of the latter should be of particular interest to our readers; noteworthy, the process of rapid drying varnish, of solvent recovery in the manufacture of artificial leather, and the prevention of clouds in clear Celluloid sheet.



THE preparation of this material was undertaken in conjunction with some purely technical research of a rather extensive character. These tables, therefore, might well be spoken of in the strictly academic sense. They are published, however, in the belief that some of the information they contain will offer new benefits to their users. It seemed wise, moreover, to preserve, in readily accessible form, the data collected, hopeful that future developments would supply much of the important information that is now lacking.

In editing and compiling such an extensive table, one necessarily becomes deeply indebted to current literature and past research. An acknowledgment must also be tendered to that ever present human factor of error: while it is believed that the material is accurate, it should not be presented as such without a general reservation.

Commercial research may—and undoubtedly will—overlook some of the headings for this table. That, of course, is a triumph for the academician. Such is not true, however in the case of many other headings.

A determination of the refractive index of various fractions distilled from lacquer solvents often yields useful commercial information. Flash points of a plasticizer may give some indication of their inflammability, although they do not indicate the relative merits of the plasticizers as fire retarders or stimulators.[1]

To the commercial lacquer manufacturer the critical (solution) temperature listed in the table is best known as the aniline point—the maximum temperature at which equal volumes of a lacquer diluent and aniline do not dissolve each other. Even such a man realizes that a practical diluent is only valuable if it possesses a low critical temperature. So much in justification of the practical aspects!

The so-called non-solvents of nitrocellulose are predominant in this review. A large portion of them, the alcohols, though classified as diluents do not materially lower the dilution ratio. They may well be classified as "latent solvents".[2] In general, the coal-tar distillates are recognized as the standard lacquer diluents, although recently the aliphatic petroleum distillates, a type of petroleum spirits, have also won that distinction.

As is true with practically all solids and liquids, the boiling point of plasticizers is no safe measure of their volatility. Evaporation determination at a higher temperature, still below the boiling point, is the preferred method of establishing volatility. However, the vapor pressure determination, though more difficult, is the more technical procedure in such a summary as the present one.

In the case of viscosity, it has been pointed out by Hoffman,[3] that that of the solvent does not parallel the viscosity of the solution. A viscosity ratio, however, has been established by the same writer. For example, commercial two-type solvents have lower ratios than the lowest single type, ethyl acetate. Moreover, all single type solvents yield solutions lower in viscosity than any of the two-type solvents. In the case of a mixture of solvents, the solvent power is normally the dilution ratio, with nitrocellulose solvents stated only in respect to one definite diluent. Wherever possible, this has been carried out in the table.

While the other headings need little explanation, the consultant working from them must proceed cautiously. As an example, the flash points given may have no direct relation to the explosiveness of the solution, since this may often be lower than that of its constituent. Such a word of warning is only an elementary, and the author hopes, unnecessary precaution.

[1]Henry A. Gardner in his extensive work "Physical & Chemical Examination of Paints, Varnishes, Lacquers and Colors" has developed lacquer inflammability tests with known plasticizers.
[2]Lichtenberg, Am. Paint J. 14, No. 31, 68 (1930).
[3]Official Digest Fed. Prod. Men's Clubs, No. 88, 20 (1929).

S: Solvent SS: Solvent Softener NSS: Nonsolvent Softener P: Plasticizer

S = Solidifies or Melts F = Flash Point

L = Latent Heat of Fusion S = Specific Heat

Names	Formulae Emperical Structural	Mol Wt	Sp Gr	D: Diluent	B: Boiling Point	Vapour Pressure	Critical T. Temp. P. Pressure	Viscosity Centipoises	V: Latent Heat of Vaporization	Capillary Constant	Refractive Index	Surface Tension
Abietic Acid	$C_{20}H_{30}O_2$ $C_{19}H_{29}COOH$	302		D	S 166							
Acetal	$C_6H_{14}O_2$ $CH_3CH(OC_2H_5)_2$	118 T	0.8314 T 20	D					S 57.7/13-93 T V 66.2/103.2		1.38193/20 T	21.65/20 T
Acet aldehyde	C_2H_4O CH_3CHO	44 T	0.781 T	D	S -123.5 T B 20.2			0.2234/19.17 T	V 136.1/21 T		1.3316 T	21.2/20 T
Acetaldol	$C_4H_8O_2$ $CH_3CHOHCH_2CHO$	88 T	1.1208 B 0°		S < 0 B F 83 2 B 83/20 B							
Acetamide	C_2H_5ON CH_3CONH_2	59 T	1.159 T	P	S 81 T B 222 T			1.32 /105 T			1.4274 T	39.3/85 T
Acetanilide	C_8H_9ON $C_6H_5NHCOCH_3$	135 T	1.2105 T 4°	P	S 114.2 T B 303.8 T							35.6/120 T
Acetic Acid	$C_2H_4O_2$ CH_3COOH	60 T	1.049 T 1.0446 22.5	S	S 16.7 T F 44 29 B 118.1	11.7/20 T 20.4/30 T	T 321.5 B P 57.2 T		L 44. T D S .487/20 3 V 97.05		1.3714 T 1.37152 T 22.5	27.63/20 T
Acetic Anhydride	$C_4H_6O_3$ $(CH_3CO)_2O$	102 T	1.082 T	S	S -73 T B 139.5 T	5.0/25 T	T 296 T P 46. T	0.98 /25 T	V 66.0 /127 T		1.3904 T	
mono Acetin	$C_5H_{10}O_4$ $CH_2COOCH_2CHOH CH_2OH$	134 T	1.20 T	SS	F 148.3 B 158/18.5 T						1.4535 T	43.5/17 T 41.4/37.5
di Acetin	$C_7H_{12}O_5$ $(CH_3COO)_2CH_2CH CH_2OH$	176 T	1.1779 B 15/15	SS	F 146 4 B 176/40 T						1.4395 T	
tri Acetin	$C_9H_{14}O_6$ $(CH_3COO)_3CH_2CH CH_3$	218 T	1.61 T 1.603 38 15/15	SS	F 133 4 T B 259 T						1.4328 D 15°	37.8/-19 T 30.1/99
Acetone	C_3H_6O CH_3COCH_3	54 T	0.7912 T 0.79115 T 19.4	S	S -94.3 T F -18±2 T B 56.1 T	184.3/20 6 229/25 T	T 235 5 P 47 5	0.304/25 T	L 23.4 T S .528 5 5 V 124.6		1.3591 T 1.35886 T 19.4	23.7/20 T
Acetone Alcohol	$C_4H_{12}O_2$ $(CH_3)_2COHCH_2CO CH_3$	116 T	0.931/25 T	S	S 54.5-57 5 F 55± 5 B 166 T	8-9/20 5					1.4210 T	
Aceto-nitrile	C_2H_3N CH_3CN	41 T	0.7897 B 15 T 0.7863 15.5	D	S 41 T B 82 T		T 274.7 T P 47.7 T	0.34 /25 T	S 542/21-76 T V 172		1.3474 T 1.34596 16.5	29.30/20 T
Aceto-phenone	C_8H_8O $C_6H_5COCH_3$	120 T	1.028 T 1.0283 19.1	NSS	S 19.7 T F 105 29 B 202.3 T	0.43/30 T			S 473/20-196 T V 77.3/204		1.5339 1.53427 19.1 T	30.8/20 T
p-Acet-phenetidin	$C_{10}H_{13}O_2N$ $C_6H_4OC_2H_5CH_3$ $NH\cdot CO\cdot CH_3$	179		P	S 135. T B decomp							
Acettoluidid	$C_{11}H_{13}O_2N$ $CH_3C_6H_4NHCOCH_3$ $COCH_3$	191		P								
Acetyl-acetone	$C_5H_8O_2$ $CH_3COCH_2COCH_3$	100 T	0.976 T 0.9776 T 19.3	S	S -23.2 T B 137. T						1.45178 T 18.5 1.4512 T	31.2/20 T
Acetylaniline n Phenyldiacetamid Di-acetanilid	$C_{10}H_{11}O_2N$ $C_6H_5N(COCH_3)_2$	177		NSS	S 37.5 T B 163/11 T							
Acetyl-Chloride	C_2H_3OCl CH_3COCl	78 T	1.104 T 1.1057 T 20	S	S -112 T B 52 T				V 78.8/51 T		1.3898 T 1.38976 T 20	26.7/14.8 T
Acetyl-phenyl-naphthylamine	$C_{18}H_{15}ON$ $C_{10}H_7N(COCH_3)$ C_6H_5	261		P								
Acetyl-phenyl β-naphthylamine	$C_{18}H_{15}ON$ $C_{10}H_7N(C_6H_5)COCH_3$	261		P	S 93 B							
Acetyl-diphenylamine	$C_{14}H_{13}ON$ $(C_6H_5)_2NCOCH_3$	210		P	S 93.5 B							
Acetylene tetra bromide, Tetrabromethane 16.4.3	$C_2H_2Br_4$ $CHBr_2\cdot CHBr_2$	345 T	2.9673 T 20°	D	S <-20 B B. 151/54 T						1.636 T 1.63726 T 20	

Names	Formulae Emperical Structural	Mol Wt	Sp Gr.	D = Diluent	S = Solidifies or Melts; F = Flash Point; B = Boiling Point	Vapour Pressure	Critical T = Temp. P = Pressure	Viscosity Centipoises	L = Latent Heat of Fusion; S = Specific Heat; V = Latent Heat of Vaporization	Capillary Constant	Refractive Index	Surface Tension
Acetylene dichloride 1.2 Dichlorethene α A " "	$C_2H_2Cl_2$ $CHCl \cdot CHCl$	97	1.291/4	D	S -80.5 F 2 B 60.3	205/20		0.391/25	S .27/18 V 41		1.519 15	
Acetylene tetra chloride Tetra chlor ethene	$C_2H_2Cl_4$ $CHCl_2 \cdot CHCl_2$	167	1.600 1.5466 23.2	D	S -43.8 B 146.3	11/20		1.637/25	S .269/20 V 54.4		1.4942 1.48162 23.2	
Adipic Acid Adipinic Acid	$C_6H_{10}O_4$ $COOH(CH_2)_4COOH$	146		D	S 151. B 265/100							
Allyl Alcohol	C_3H_6O $CH_2 \cdot CH \cdot CH_2OH$	58	0.8573 0.85440	LS	S -129 B 96.69		T 271.9	1.283/22.8	S .664/21-96 V 163.5/96		1.41345 20	28.8/20
Iso Amyl Acetoacetate	$C_9H_{16}O_3$ $CH_3CO\,CH_2\,COO(CH_2)$ $CH(CH_3)_2$	172	0.954 19/7.5 0.9732 18.7	S	B 223						1.42617 18.9	
Amyl-adipate Diiso-amyl-adipate Sipelin	$C_{16}H_{30}O_4$ $(CH_2)_4[COO(CH_2)_2$ $CH(CH_3)_2]_{2a}$	286	0.954	SS								
Amyl Acetate (primary, normal)	$C_7H_{14}O_2$ $CH_3COOCH_2(CH_2)_3$ CH_3	130	0.879 20/20	S	B 309 B 147.6			0811/25	V 69./142		1.4012	
Amyl Acetate (Secondary, normal)	$C_7H_{14}O_2$ $CH_3COO \cdot CH \cdot CH_3$ $(CH_2)_2 \cdot CH_3$	130	0.869	S	B 131						1.3960	
Amyl Acetate (active)	$C_7H_{14}O_2$ CH_3COOCH_2CH $CH_3CH_2CH_2$	130	0.8803 12.5	S	B 1412-20						1.4012	
iso Amyl Acetate (primary)	$C_7H_{14}O_2$ $CH_3COOCH_2CH_2$ $CH \cdot (CH_3)_2$	130	0.875 0.87450 17.9	S	F 25. B 142.5		T 326	0 79 /25	S .458/20 V 69 /143		1 3999 1.40170 17.9	24.7/20
Amyl Acetate (commercial from fusel oil)		130	0.875	S	F 37.7 B 138-42	4.5/18 20						
Amyl Acetate (Synthetic)		130	0.856-66	S	F 25 B 126-55						1.4000	
Amyl acetyl Glycolate	$C_9H_{16}O_4$ CH_3COOCH_2COO $(CH_2)_3CH(CH_3)_2$	188		SS								
n Amyl Alcohol (primary)	$C_5H_{12}O$ $CH_3(CH_2)_3CH_2OH$	88	0.817 0.81/23 1440	LS	S -78.5 F 46 B 138	2.8/20		4.573/233	V 120/131		1.414/16 1.40963 14.60	
n Amyl Alcohol (secondary)	$C_5H_{12}O$ $CH_3(CH_2)_2\,CHOH$ CH_3	88	0.815	LS	B 119			3 10 /25			1.4072	
Amyl Alcohol (active)	$C_5H_{12}O$ $CH_3CH_2CHCH_3CH_2$ OH	88	0.8169	LS	B 128				S .710/22-125			
iso Amyl Alcohol (primary)	$C_5H_{12}O$ $(CH_3)_2CH \cdot CH_2 \cdot CH_2OH$	88	0.812/20 0.8134 17.8	LS	S -117.2 F 40-2 B 130.5	2.3/20	T 307	3.80 /25	S 60 V 120/130		1.4075 1.4084 17.8	23.6/15 23.8/20
iso Amyl Alcohol (secondary)	$C_5H_{12}O$ $(CH_3)_2CH\,CHOHCH_3$	88	0.819/19	LS	B 112.5							
Amyl Alcohol (tertiary)	$C_5H_{12}O$ $(CH_3)_2CO\,HC_2H_5$	88	0.810/20	LS	S -11.9 F 20 B 101.8		T 272	3.63 /25	L 12.5 S .753/20-99 V 106/102		1.406	15.2/120
Amyl Alcohol (com'l-fusel oil)	$C_5H_{12}O$	88	0.815-7 15	LS	F 40-6 B 128-32	9-10/20					1.39-40	
Amyl Alcohol (synthetic) Others P5-#15+16	$C_5H_{12}O$	88	0.812 20/20	LS	B 112-40							
n Amyl Amine (primary)	$C_5H_{13}N$ $CH_3(CH_2)_3CH_2NH_2$	87	0.766 19°	D	S -55 B 104				V 985/95			20.4/41.2
iso Amyl Amine	$C_5H_{13}N$ $(CH_3)_2CH(CH_2)_2NH_2$	87	0.7514 17.9	D	B 95			0 7235/25	S .614/22-91		1.4088 1.40959 17.9	23.6/20
diiso Amyl Amine	$C_{10}H_{23}N$ $[(CH_3)_2CH(CH_2)_2]_2NH$	157	0.767 0.7612 21.1	D							1.424 1.42289 21.1	26.5/20 17.9/80

S = Solvent · SS = Solvent Softener · NSS = Nonsolvent Softener · P = Plasticizer

S = Solidifies or Melts · F = Flash Point · B = Boiling Point · Vapour Pressure · Critical T. Temp. p. Pressure · Viscosity Centipoises · L = Latent Heat of Fusion · V = Latent Heat of Vaporization · S = Specific Heat · Capillary Constant · Refractive Index · Surface Tension · D = Diluent

Names	Formulae Emperical Structural	Mol Wt	Sp. Gr.	D = Diluent	B = Boiling Point	Vapour Pressure	Critical T. Temp. p. Pressure	Viscosity Centipoises	V = Latent Heat of Vaporization	Capillary Constant	Refractive Index	Surface Tension
tri iso Amyl Amine	$C_{15}H_{33}N$ $[(CH_3)_2CH(CH_2)_2]_3N$	227 T	0.785 T 25/25	D	S 190 T B 237 T							24.5/20 T
n Amyl Benzoate	$C_{12}H_{16}O_2$ $C_6H_5COO(CH_2)_4CH_3$	192 T	0.989 T 0.9910 17.4	SS	B 261 decom T						1.494 T 1.50530 17.4	
Iso Amyl Benzoate	$C_{12}H_{16}O_2$ $C_6H_5COO(CH_2)_2CH(CH_3)_2$	192	0.993 T	SS	B 262 T							
iso Amyl Borate	$C_{15}H_{33}O_3B$ $BO_3[CH_2CH(CH_3)_2]_3$	272	0.872 B 0	SS	B 254-5 B						1.42 C	
iso Amyl Butyrate	$C_9H_{18}O_2$ $CH_3(CH_2)_2COO(CH_2)_2CH(CH_3)_2$	158 T	0.882 T 0/0	S	B 178.6 T		T 346 T		S .458/20 T V 61.79 3			25.19/20 T
iso Amyl Carbonate	$C_{11}H_{22}O_3$ $[(CH_3)_2CH(CH_2)_2]_2CO_3$	202 T	0.912 T 15°	S	B 228.7 T						1.417 T	
n Amyl Chloride	$C_5H_{11}Cl$ $CH_3(CH_2)_4Cl$	106 T	0.883 T 0.8720 18.2	D	B 105.7 T						1.4119 T 1.4097 18.2	
iso Amyl Chloride	$C_5H_{11}Cl$ $(CH_3)_2CH(CH_2)_2Cl$	106 T	0.893 T	D	B 99.1 T						1.4103 T	23.48 T/20
iso Amyl Chloracetate	$C_7H_{13}O_2Cl$ $CH_2ClCOO(CH_2)_2CH(CH_3)_2$	164 T	1.041 T 25/25	S	B 192 T							
Amyl Cinnamate	$C_{14}H_{18}O_2$ $C_6H_5CH_2CHCO_2CH_2CHCH_3CH_2CH_3$	218	0.9992 B	SS	B 192/29 B						1.5350 N	
Amyl Ether (active)	$C_{10}H_{22}O$ $[CH_3C_2H_5CHCH_2]_2O$	158 T	0.7745 T	LS	B 190 T							
iso Amyl Ether	$C_{10}H_{22}O$ $[(CH_3)_2CH(CH_2)_2]_2O$	158 T	0.783 T 11.8°	LS	B 172 T			1.40/11 T			1.408 T	23.2/17.8 T 19.5/64 T
n Amyl Formate	$C_6H_{12}O_2$ $HCOO(CH_2)_4CH_3$	116 T	0.902 T 0.8832 11.5	S	F 26 T B 130.4 T	33.2/20 T					1.3951 T 11.5	24.6/20 T
iso Amyl Formate	$C_6H_{12}O_2$ $HCOO(CH_2)_2CH(CH_3)_2$	116 T	0.871 T	S	B 123.5 T	9.4/20 T	T 303 T	0.794/20 T	S .458/20 T V 73.76 3		1.391 T	24.58 T 24.7/20 T
iso Amyl Furoate	$C_{10}H_{14}O_3$ $C_4H_3O\,COO(CH_2)_2CH(CH_3)_2$	182	1.0335	SS	B 233 12						1.4720 T	
iso Amyl Lactate	$C_8H_{16}O_3$ $CH_3CHOH\,COO(CH_2)_2CH(CH_3)_2$	160 T	0.9644 4	SS	B 110/21.5 T							
iso Amyl Oxalate	$C_{12}H_{22}O_4$ $[COO(CH_2)_2CH(CH_3)_2]_2$	230 T	0.968 T/ 11°	SS	B 265 T				S .448/20 T		1.4168 B 11°	
iso Amyl Palmitate	$C_{21}H_{42}O_2$ $CH_3(CH_2)_{14}COO(CH_2)_2CH(CH_3)_2$	338		NSS	S 9 B							
di iso Amyl Phthalate	$C_{16}H_{22}O_4$ $C_6H_4(COOC_5H_{11})_2$	306 T	1.023 T	SS	B 344 T						1.4865 T	31.5/20 T
Amyl Propionate (active)	$C_8H_{16}O_2$ $CH_3CH_2COOCH_2CH_3CH{\cdot}CH_2{\cdot}CH_3$	144	0.866 T	S	B 58/14 T	11.6 T/20					1.4015 T	
iso Amyl Propionate	$C_8H_{16}O_2$ $C_2H_5COO(CH_2)_2CH(CH_3)_2$	144 T	0.870 T	S	F 63. 9 B 160.2 T		T 338		S .458/20 T V 65.31 3		1.4065 T	12.4/180 T
iso Amyl Salicylate	$C_{12}H_{16}O_3$ $HOC_6H_4COOCH_2CH_2CH(CH_3)_2$	208	1.045 T 24/25	NSS	F 132 29 B 273 T						1.506 B	
Amyl Stearate	$C_{23}H_{46}O_2$ $CH_3(CH_2)_{16}COOCH_2CH{\cdot}CH_2CH_2CH_3$	354		NSS	B 208/4 13							29.1/30 T
iso Amyl Stearate	$C_{23}H_{46}O_2$ $CH_3(CH_2)_{16}COO(CH_2)_2CH(CH_3)_2$	354	0.862 T	NSS	S 21 B B B360 ±							

S = Solvent
SS = Solvent Softener
NSS = Nonsolvent Softener
P = Plasticizer
S = Solidifies or Melts
F = Flash Point
L = Latent Heat of Fusion
S = Specific Heat

Names	Formulae Empirical Structural	Mol Wt	Sp Gr.	D = Diluent	B = Boiling Point	Vapour Pressure	Critical T = Temp. P = Pressure	Viscosity Centipoises	V = Latent Heat of Vaporization	Capillary Constant	Refractive Index	Surface Tension
di-iso Amyl Tartrate	$C_{14}H_{26}O_6$ $(CHOH\ COO(CH_2)_2CH(CH_3)_2]_2$	290	1.063 15°	SS	B 195/16						1.45	
Amylene dichloride	$C_5H_{10}Cl_2$ $CH_3CH_2(CHCl)_2CH_3$	140	1.085	D	F 43 B 139							
Amylene Glycole 1:2	$C_5H_{12}O_2$ $CH_2OH\ CHOH\ (CH_2)_2\ CH_3$	104	0.980 20/20	D	B 211.8						1.441	
Amylene Glycole 1:5	$C_5H_{12}O_2$ $CH_2OH(CH_2)_3CH_2OH$	104	0.994 20/20	D	B 239.4						1.4499	
Aniline	C_6H_7N $C_6H_5NH_2$	93	1.022 1.0216 20		S -6.2 F 71 B 184.4	2.4/50	T 426 P 52.40 Atm	3.70/25	L 21 S 502/50 V 103.5/183		1.5863 1.58629 20	42.9/20
Anisic Aldehyde	$C_8H_8O_2$ $C_6H_4CHO\cdot CH_3OH$	136	1.123 1.1302 12.7	D	S 2.5 B 247						1.57441 12.7°	44.9/0 33.7/101
Anisol Phenyl-Methyl-Ether	C_7H_8O $C_6H_5OCH_3$	108	0.994 0.9989 16.5	D	S -37.3 B 155.8		T 369 P 41.3	1.01/25	V 81.5/153		1.517 1.51950 16.9	35.22/20
Amyl Alcohol di ethyl carbinol	$C_5H_{12}O$ $(CH_3CH_2)_2CHOH$	88	0.816 25°		B 115.7						1.4110	
2nd n. Amyl Alcohol Tertiary butyl-carbinol	$C_5H_{12}O$ $(CH_3)_3C\ CH_2OH$	88	0.810-25		S 53 B 114	16/20						
Benzal Bromide	$C_7H_6Br_2$ $C_6H_5CHBr_2$	250	1.51 15°	D	B 140/20						1.541	
Benzal Chloride	$C_7H_6Cl_2$ $C_6H_5CHCl_2$	161	1.295 16°	D	S -17.4 B 214							202/20.3
Benzaldehyde	C_7H_6O C_6H_5CHO	106	1.046 1.0492 17.6	D	S -56 F 62.5 B 179.5	1.1/30		1.140/25	S 142/22-178 V 86.5/179		1.5464 1.54629 17.2	40.4/20
Benzanilid	$C_{13}H_{11}ON$ $C_6H_5NHCOC_6H_5$	197	1.3214	P	S 161 B 117.9/10							
Benzoin	$C_{14}H_{12}O_2$ $C_6H_5COCH\ OH\ C_6H_5$	212		D	S 133							
Benzol	C_6H_6	78	0.878 0.8791 20	D	S 5.5 F -8...12.2 B 79.6		T 288.5 P 47.7	0.60/25	L 30.4 S 406/20 V 99.5/80		1.50144 20	28.88/20
Benzol monoethyl sulfonamid	$C_8H_{11}O_2NS$ $C_6H_5SO_2NHC_2H_5$	185		P	S 57-8							
Benzol-methyl-ethyl sulfonamid	$C_9H_{13}O_2NS$ $C_6H_5SO_2NCH_3C_2H_5$	199		P								
Benzonitrile	C_7H_5N C_6H_5CN	103	1.008 16.8° 1.0003 25.5	D	S -13.1 B 190.7			1.25/25	V 87.8/189		1.52570 25.8	
Benzyl abietate	$C_{34}H_{54}O_2$ $C_{19}H_{27}COOCH_2C_6H_5$	378	1.036 14°4	P	B 294-7/4'						1.551	
Benzyl acetal	$C_{11}H_{18}O_2$ $CH_3CH(OCH_2C_6H_5)_2$	242		P								
Benzyl acetate	$C_9H_{10}O_2$ $CH_3COOCH_2C_6H_5$	150	1.058	S	S -51. F 93 B 213.5			1.423/45			1.5232	
Benzyl acetone	$C_{10}H_{12}O$ $C_6H_5CH_2CH_2CO\ CH_3$	148	0.989 24/15	S	B 236							
Benzyl adipate	$C_{20}H_{22}O_4$ $(CH_2)_4(COOCH_2C_6H_5)_2$	326		SS								
Benzyl alcohol	C_7H_8O $C_6H_5CH_2OH$	108	1.046 1.0429 20	S	S -15.3 F 100 B 205.8	1 / 61		5.054/25	S 570/20-120 V 112.2/204		1.5393 1.53955 20	38.11 39.0/20
Benzyl amine	C_7H_9N $C_6H_5CH_2NH_2$	107	0.9813 0.9827 19.5	D	B 1845			1.59/25			1.54406 19.5	39.5/20

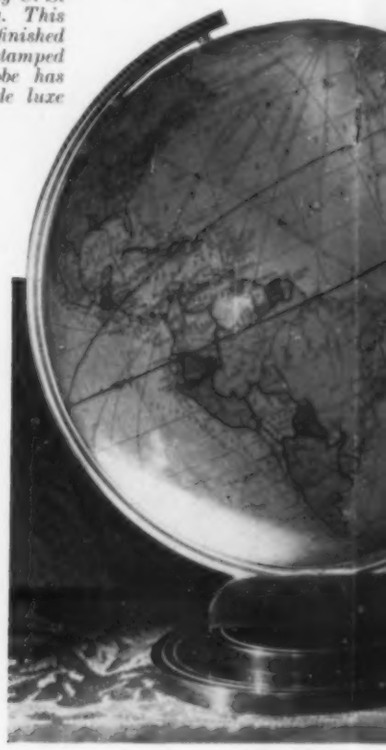
Plastics in Pictures

At the Fourth Packaging Exposition held in New York, a few weeks ago, the Celluloid Corporation exhibited products of their different customers wrapped in Protectoid Transparent Wrapping, a cellulose acetate material, which was the feature of their outstanding display.

This exhibit of the Bakelite Corporation at the First International Beer, Wine and Liquor Show held in New York recently, graphically portrayed the advantages of molded closures for wine and liquor bottles. Serving trays, signs, bottle openers, beverage dispensers, and a tricky, little insulated stein that keeps beer cold and palatable, were a few of the many accessories on display, which attracted many visitors.

Milady will soon be tucking her jewels away in a molded jewelry case. Concealed spring hinges, consisting merely of a tiny spring-metal clip, the tension of which snaps the cover of the box into either open or closed position, are a feature of these molded Durez utility boxes, especially suitable for jewelry, and manufactured by Rathbun Manufacturing Company. The hinges are applied without tools or special equipment.

As Atlas, in ancient Greek mythology, was fabled to uphold the sky, so today Bakelite carries out this tradition in a molded base that supports a terrestrial globe made by C. S. Hammond & Company. This well designed, finely finished base supersedes a stamped metal unit. The globe has been developed as a de luxe premium item.



Helena Rubinstein offers her face powder and rouge combination compactly wrapped in Cellophane. The powder box has a cut-out section in the lid in which sets the rouge compact, which is held in place by a Cellophane covering of the entire lid.

Below, tube of brushless shave cream which won Wolf award in the collapsible tube division at the Fourth Packaging Exposition. Designed, entered and used by Monigomery Ward & Company. Durez cap molded by Colt. Photograph by Edward H. Rehnquist.

Hostess
Catalin,
rette Ligh
Award in
containers
Packaging
by Platin
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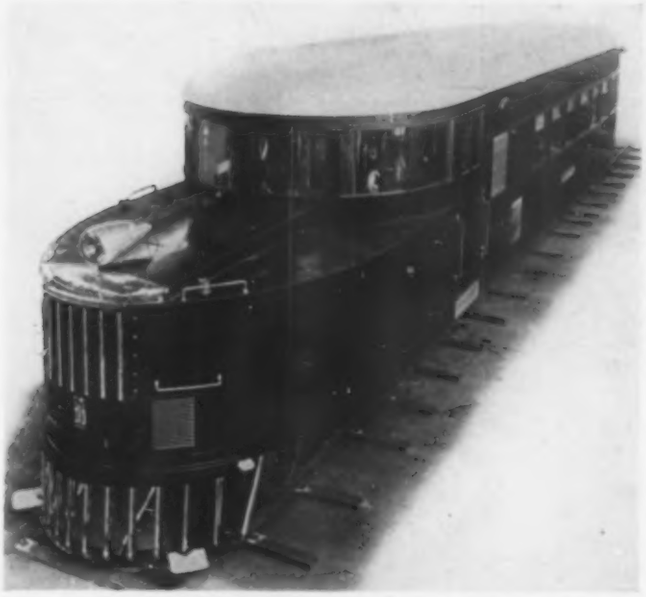
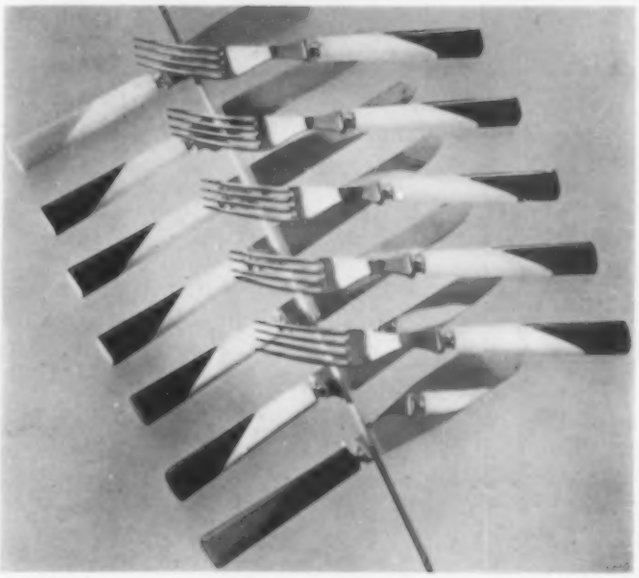
Arens. P
Demarest.

A modern coffee table finished with Tarso Amboyna. The synthetic marble reproduction embodied in Triplex Glass provides the top.



How large orders for safety glass will be effected if the public be pleased policy is carried out by railroad companies in installing safety glass windows in their newer type trains.



A new dress for an age-old utensil. Bakelite Transparent Resinoid has turned the lowly kitchen cutlery into a thing of beauty by providing handles in multi-colored effects. In addition to the very evident advantages in appearance these handles offer great utility in that they successfully withstand washing in soapy waters. A product of The Goodsell Company.

Hostess package, molded of Catalin, for Lektrolite Cigarette Lighter, which won Wolf Award in the molded plastic containers division of the Packaging Exposition. Used by Platinum Products Company and designed by Egmont Arens. Photograph by F. M. Demarest.

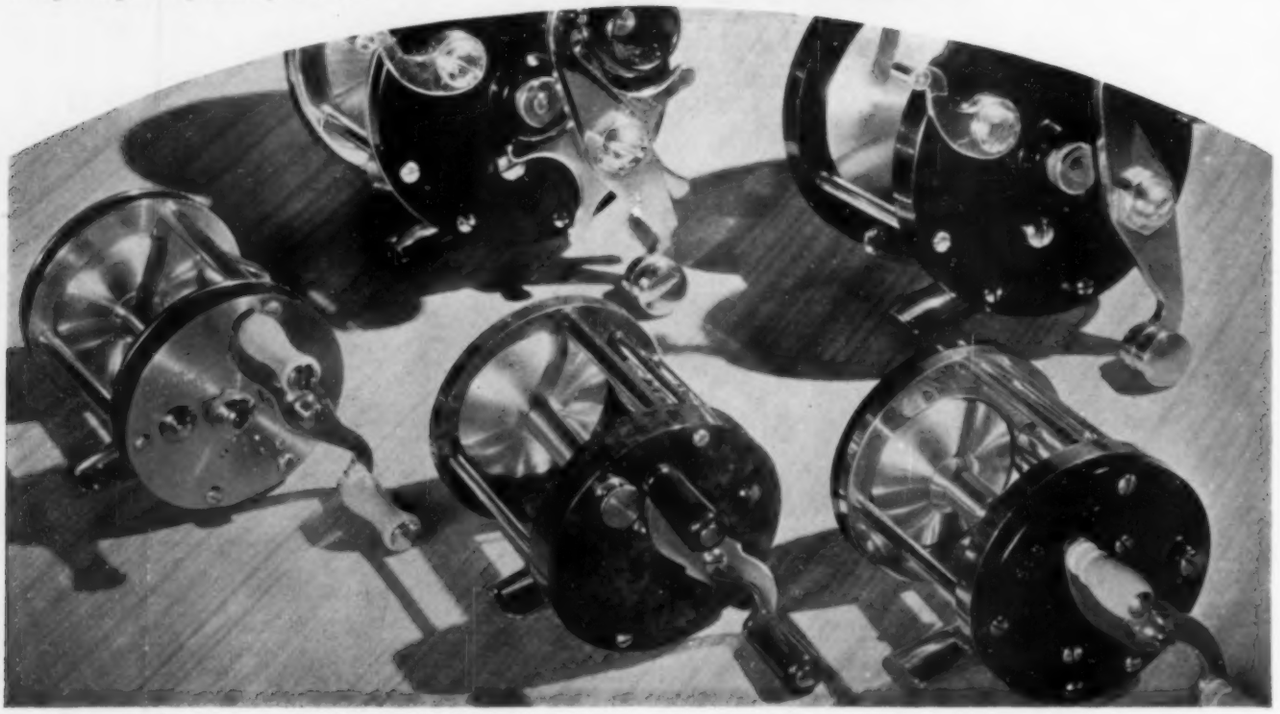
Something new in a pocket watch which bids fair to gain rapid prominence. The Westclox Handbag Watch, recently brought out by the Western Clock Company, has a gold plated winding stem which is streamlined into the top of the lustrous black molded case. Numerals in white enamel provide the finishing touch of bold contrast, altogether the whole presenting an effect never before obtained in a timepiece. Designed by Industrial Design, Inc.

The newest perfume packaging wrinkle. Mysterious little crystal spheres that stand on their heads, have no apparent openings, yet release drops of perfume when wanted, and are evaporation-proof. The mystery is explained by the cube-shaped molded plastic screwcap which, when inverted, serves as the base, and carries the perfumer's name molded into the surface. Maison Jeurelle.

A gadget named "Even Steven" invented by J. Dean Spencer who advocates its use for greater shaving satisfaction. It's really a brushless shave applicator to be screwed on the top of a tube of brushless shave cream. A ribbed roller in the top does the trick for the user.

Believe it or not but the scalp is coming in for a share of the benefits to be derived from this plastic age of invention. These neat looking articles are plastic closures for hair preparations and are of the automatic sprinkler top type. When the closure is rubbed into the scalp, the preparation flows out. Molded of lustrous Durez.

Fishermen, experts and beginners both, prize reels which are sturdy, dependable, and free-running. The Bronson Reel line includes several models constructed from chromium plated metal and Bakelite Molded. These reels are impervious to the effects of salt water and sea atmosphere. They cannot rust, thereby insuring a long term of trouble-free service.



Industrial Coatings

A department devoted to the manufacture and industrial applications of lacquers, varnishes, other finishes, coated and impregnated fabrics.

Alkyd Resins in Coatings

By John McE. Sanderson

Among the most interesting of the numerous synthetic resins which have been developed during recent years for use in surface coatings are the alkyd types sold under the trade-marked names of Rezyl and Teglac.[1] They are made from a wide range of polybasic acids, polyhydric alcohols and modifying agents combined under different conditions to produce a variety of resins suited for use in such widely different finishes as nitrocellulose lacquers, cellulose acetate lacquers, paint and varnish products, so-called synthetic finishes, textile and paper coatings, water solutions and others.

The various alkyd resins range from viscous liquids to hard brittle solids and in color from deep amber to water white. These are not mere differences in quality produced by the use of more or less carefully refined raw materials or by dilution with other materials. They are distinctly different compounds adapted to specific uses. In spite of their differences they have certain qualities in common, the most outstanding being their development and retention of adhesion and toughness with age coupled with opacity to ultra-violet light and a remarkable durability on weather exposure. Most of their important uses are based on these qualities.

For a clear understanding of the possibilities of formulating with these resins they are classified according to their suitability for various uses into three groups, the members of which have certain similar characteristics. These groups are as follows:

1. Lacquer type, or saturated Rezyl resins. This group of resins is suited primarily for use with nitrocellulose.
2. Teglac resins which are alkyd types modified principally with natural resin acids.
3. Oxidizing type or unsaturated Rezyl resins which have uses similar to those of oleo-resinous varnishes and drying oils.

GROUP I

Rezyl Resins for Use in Lacquer

These saturated alkyd resins have during the past few years firmly established themselves in lacquer formulation to replace some of the resins and other ingredients formerly used. The principal characteristics on which their use is based are toughness resistance to oil, gloss retention and outdoor durability. Among the various types which are available the following are of most general interest:

Physical and Chemical Characteristics

Rezyl	*12*	*14*	*19*	*53*
Sp. Gr.	1.21	1.32	1.21	1.15
Lbs. per gal.	10.1	11.0	10.1	9.6
Color (50% Solution).	5-L	1-L	4-L	3
Acid Number	20-28	25-35	20-28	18-24
Soft. Pt. (A.S.T.M.)	62-67° C.	60-66° C.	63-68° C.	..
Consistency at 20° C.	Solid	Solid	Solid	Liquid
Stock toluol sol.	"O"	....	"L"	"F"
Solids in sol.	50%	....	50%	80%
Lbs. per gal. sol.	8.4	....	8.4	9.1

These resins, with the exception of Rezyl 14, are soluble in toluol and may be used with the ordinary lacquer thinners. This last named resin may be dissolved in equal parts toluol and ethyl acetate and will stand more dilution with alcohol than the other resins in this group. When used in lacquers a little more than the usual minimum of ethyl acetate and butanol should be used for complete solution.

They require no dewaxing or other special treatment and are readily compatible with nitrocellulose as well as with dibutyl phthalate and other usual lacquer ingredients. They can be used with the ordinary pigments except zinc oxide and other highly basic types. As a flatting agent, in lacquers formulated with these resins, fine diatomaceous silica is preferable to metallic soaps.

Rezyl 12 is used in clear and pigmented automobile, furniture and metal lacquers for adhesion, toughness, outdoor durability and resistance to rubbing oils and alcohol.

Rezyl 14 is used in clear lacquers for polished metal because of its extremely pale color, excellent adhesion and outdoor durability. It is also used in enamels for good color, hardness and gloss. It is compatible to some extent with cellulose acetate.

Rezyl 19 is pale in color and has very little tendency toward after yellowing. It is therefore suggested particularly for white enamels, clear automobile and sign lacquers and pearl finishes.

Rezyl 53 is semi-flexible and has a partial plasticizing action. It has good adhesion and is resistant to water, alcohol and SO_2.

The resins in this group and the Teglac resins in the next are of particular interest for use in lacquers with nitrocellulose of 5 sec. or higher viscosity.

The essential difference between modern lacquers and those which were made twenty years ago is a higher solid content which

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permits the application of a film of satisfactory thickness with fewer coats. Originally this was obtained by making nitrocellulose of lower viscosity, so that a greater amount could be dissolved per gallon of solvent while still keeping the consistency of the solution within practical working limits. Owing to the softness, brittleness and lack of durability of the resins which were then available, such as ester gum and damar, only small proportions could be used in ordinary lacquers. Therefore in these lacquers in which the solid portion had to be largely nitrocellulose, it was highly important to have the latter as low in viscosity as possible. Hence the widespread development in the use of nitrocellulose of ½ sec. or even lower viscosity.

Some of the new materials which have been developed in the last ten years permit radical changes in lacquer formulation. Rezyl resins, for instance, are not only tough but actually impart improved outdoor durability. They can, therefore, be used in much higher proportions of resin to nitrocellulose than was practical in older type lacquers for autos and other outdoor use. Teglac resins, while lacking the superior outdoor durability of the latter types, are not only tougher than the common natural resins but, being much harder, permit the use of higher ratios of resin to nitrocellulose, as well as the use of some additional plasticizer for elasticity, without making the film soft and sticky.

With a high ratio of either Rezyl or Teglac resin to nitrocellulose the latter can be 5 sec. viscosity, without sacrificing much in solid content at working consistency. Such lacquers may, in some instances, require minor modifications of solvents, methods of application or drying conditions to fit their working properties and may be varied over a wide range to meet individual ideas.

GROUP II

Teglac Resins

Teglac No.	*Sp. Gr. @ 20° C.*	*Weight per gal.*	*Acid No.*	*Softening Point (ASTM)*	*Color* **
15.....	1.14	9.5	12-18	86-91° C.	7L
Z152....	1.14	9.5	30-40	140-150° C.	5L
Z154....	1.12	9.3	18-25	110-115° C.	5L

Use in lacquers: These resins have a wide field of application in nitrocellulose lacquers, for indoor use. Their outstanding characteristics are hardness, and a high refractive index which imparts exceptional gloss and depth to clear lacquers formulated from them. They have good sanding qualities and are resistant to rubbing oils and alcohol.

Teglac 15 combines with good hardness a toughness superior to damar or ester gum so that finishes formulated from it have less tendency to check on aging. Its color is pale with little tendency towards after yellowing. It is especially well adapted for use in clear and pigmented wood lacquers and sanding sealers.

Teglac Z154 is designed particularly for low priced lacquer sealers which will sand quickly and easily. It may also be used in clear and pigmented lacquers for indoor application.

Teglac Z152 combines exceptional hardness with very low solvent retention. This permits the use of unusually high proportions of resin to nitrocellulose in sanding sealers, clear wood lacquers and pigmented enamels for indoor use. Teglac Z152 is so hard that good sanding properties are retained even after some dilution with ester gum for reasons of economy.

Use in varnish: Teglac Z152 may be cooked with oils to obtain varnishes of good hardness and drying speed with better color retention than secured with phenol resins. Varnishes made from this have satisfactory water and alkali resistance although the kind and proportion of oil and the way it is cooked with the resin have a marked effect.

GROUP III

Oxidizing Type Rezyl Resins

These resins are distinguished from the lacquer types, in that when exposed to the air in thin layers they dry to hard solid films. They differ from other types of manufactured and natural resins in that they combine in themselves the qualities of gloss and hardness usually associated with resins, together with the elasticity of drying oils. They may therefore be used alone as durable film forming agents without cooking with oils or combination with nitrocellulose.

Rezyl 1102: Baking is required to develop the best elasticity, adhesion and durability. This resin is therefore seldom used in air dried finishes unless mixed with at least an equal quantity of Rezyl 114 or 113. It is suggested particularly for white enamels to bake at 175 to 220° F.

Rezyl 114: Recommended especially for air dried and low bake enamels. Has the best water resistance of the resins in this group but not quite as good outdoor durability. Miscible with small proportions of some short oil phenol resin varnishes, but not to any extent with oils.

Rezyl 113: Suggested for both clear and pigmented air drying finishes for exceptional outdoor durability. Has about the same miscibility with varnishes as Rezyl 114. Not quite as glossy and wrinkles more easily with excess drier.

Rezyl 110: Used in clear and pigmented finishes requiring a high proportion of petroleum solvents. Miscible with small amounts of some varnishes, with raw linseed oil up to equal parts, but not to any extent with bodied oils. May be cooked into varnish with oils and other resins.

Rezyl 1103: Used in paint vehicles, alone or blended with raw linseed oil. Added to 113 or 114 to secure enamels of improved gloss, fullness, flow and elasticity. Compatible with many varnishes and some light bodied oils. May be cooked into varnish.

Pigments: Most of the ordinary chemical and mineral colors used in oleo-resinous enamels can also be used satisfactorily in finishes containing Rezyl resins. Basic pigments such as zinc oxide, basic lead carbonate and aluminum hydrate should be avoided with these resins. Others, such as chrome orange, involve difficulty only if overheated in grinding. As a flatting agent fine diatomaceous silica is preferable to aluminum stearate or other metallic soaps.

Driers: The drying of these oxidizing resins is accelerated by the addition of small amounts of certain metals which should be

Physical and Chemical Characteristics Oxidizing Type Rezyl Resins

	Rezyl 1102	*Rezyl 114*	*Rezyl 113*	*Rezyl 110*	*Rezyl 1103*
Specific Gravity	1.22	1.14	1.14	1.13	1.07
Weight per gallon	10.16 lb.	9.50 lb.	9.50 lb.	9.40 lb.	8.95 lb.
Color (50% Solution)	5-L	7	6	5	5-L
Acid Number	52-62	28-38	21-29	48-58	27-34
Refractive Index @ 20° C.	1.5379	1.5375	1.5300	1.5230	1.5120
Softening Pt. (Ring & Ball)	60-66° C.	52-59° C.	45-50° C.	.....	.....
Consistency at 20° C.	Solid	Plastic	Plastic	Plastic	Visc. Liq.
Petroleum Tolerance	10%	30%	30%	95%	100%
Miscibility with Oil	None	Slight	Slight	Fair	Good
Stock Xylol Solution	"A"	"J"	"G"	"C"	None
Solids in Solution	40%	60%	60%	70%	.....
Wt. per Gal. Solution	8.1 lb.	8.5 lb.	8.5 lb.	8.6 lb.	.....

—HIGH HEAT—

Now that the underwriters are condemning the high heat materials having a large percentage of wood filler, the MOLDERS and MANUFACTURERS should investigate MAKALOT—High Heat No. 75-D (Black or Brown), which is an all mineral filler material that is guaranteed not to stick or stain molds.

We can also supply other high heat materials of lower specific gravity where desired. These materials are also free from all "sticking" tendencies.

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Due to the "sticking" tendencies of high heat materials made with the stiffer resins, not having the superior covering qualities of the MAKALOT resins, molders have been compelled to use the lower gravity of so-called high heat materials containing a high percentage of wood fillers. This, however, is unnecessary, as the testing of MAKALOT No. 75-D will fully demonstrate.

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added cold in the form of metallic soaps dissolved in suitable solvents. Combinations are usually more efficient in drying effect than single metals. Lead helps to dry the film through. Cobalt acts more on the surface so that an excess results in a wrinkled film. Manganese also acts on the surface but is not quite as strong as cobalt and has a tendency to discolor light tints. Zinc has a hardening effect but is sometimes used, in combination with cobalt, to secure good drying without surface wrinkling and to reduce the possibility of skinning in a partially filled container. In pigmented products the drier should be added after grinding.

Solvents: With ordinary varnishes the question of solvents is a very simple one, resolving into whether or not a given oil or resin is soluble in a given solvent. Naphtha will dissolve ester gum but not shellac and alcohol acts just the reverse. But with two solvents which both dissolve such resins or varnish base there is little difference in viscosity of the final product. The oxidizing type Rezyl resins on the other hand yield clear solutions of widely varying viscosity with different solvents. The relative strength of various solvents in reducing the viscosity of a concentrated solution of Rezyl resin in xylol is as follows:

A. Methanol, ethanol, butanol, acetone, methyl acetate, ethyl acetate.
B. Ethyl lactate, butyl lactate, butyl acetate, cellosolve, dioxan, ethylene dichloride.
C. Benzol, toluol, xylol, pine oil, chloroform, monochlorobenzol, orthodichlorbenzol.
D. High flash naphtha.
E. Tetralin, para-cymene, trichlorethylene, tetrachlorethane.
F. Dipentene, carbon tetrachloride.
G. Turpentine, decalin.
H. Naphtha, mineral spirits, kerosene.

Outdoor durability: Rezyl resins are relatively opaque to ultra-violet and highly resistant to disintegration by light and air. They are characterized by excellent gloss retention even after prolonged exposure to the weather. For clear and lightly pigmented products applied over metal the best durability is secured with Rezyl 113 or 110. To carry more pigment or for application over wood where greater distensibility is needed requires the use of 1103. The kind and proportion of pigment used in paints and enamels containing Rezyl resins will of course affect their durability as will also the undercoat and nature of the surface to which they are applied.

Paint vehicles containing Rezyl resins are of three distinct types: (1) those in which oxidizing Rezyl resin is the sole film forming binder, (2) those in which this resin predominates but to which some oil or varnish has been added to modify working characteristics and (3) those to which a little of this resin has been added to modify the oil or other major constituent. Paints of the first type undoubtedly utilize to the fullest extent the advantages of Rezyl resins in quick drying, adhesion and durability, those of the second group have the widest range of application because of their working qualities, while those in the third class are as yet of relatively minor importance. Solutions of these resins make excellent vehicles for use with aluminum bronze powder for many finishes for both indoor and outdoor use. The powder and liquid are mixed just prior to application as is customary with all bronze finishes.

Other applications for oxidizing type Rezyl resins are:

Flat Wall Paints—quick drying and adhesive.
Railway Finishes—elastic and remarkably durable.
Gas Station and Oil Refinery Equipment—resistant to gasoline and oils.
Aeroplane Finishes—beautiful, light weight and durable.
Tinware Coatings—adhesive and flexible.
Traffic Zone Paint—quick drying and durable.
Marine Paints—for surfaces other than hull bottoms.
Drum Enamels—in bright colors for quality packages.

Use in lacquers: The use of the oxidizing type Rezyl resins permits a high ratio of resin to nitrocellulose especially if the lacquer can be force dried. Such high proportions of this resin impart good adhesion and outdoor durability. This type of lacquer, however, may involve difficulties in lifting with succeeding coats except when applied exactly in accordance with a carefully regulated schedule of application.

1. Rezyl and Teglac are trade-marks of the Rezyl Corporation for whom American Cyanamid & Chemical Corporation are Sole Sale Agents. These products are protected by U. S. Patents, including License under Patents No. 1,893,873 and No. 1,893,874.

Pigment Effect on Polyhydric Alcohol-Acid Resins

Many artificial resins of the polyhydric alcohol-polybasic acid type when made into coating compositions are very sensitive to certain types of pigment, such as those containing zinc sulfide, to the extent that they thicken, liver or gell irreversibly during or after grinding with the pigment. It has been found that the trouble is due to the presence in the pigment of too high a proportion of reactive compounds, such as zinc oxide, which are soluble in acetic acid, and if the quantity of these is reduced to a sufficient extent, the pigment will no longer affect the stability of the coating composition. The pigment may be "stabilized" in various ways, such as by treatment with a dilute acid or acidic reagent (e.g. acetic, citric or sulfuric acid, or sodium bisulfate) followed by washing with water or treatment with a neutralizing or precipitating agent, for example sodium sulfide to precipitate zinc sulfide. Thus a commercial zinc sulfide which caused pronounced thickening in coating compositions and contained 1.34 per cent. of acetic acid-soluble zinc (calculated as zinc oxide) was mixed to a slurry with 10 parts of water and acidified with sulfuric acid, maintaining a *p*H value of 3.8 for an hour; after washing, the product contained only 0.1 per cent. of acetic acid-soluble zinc. A second similar treatment, except that the slurry was acidified to *p*H 3.3, reduced the acetic acid-soluble zinc to 0.041 per cent., and yielded a pigment which caused no thickening in coating compositions. Ordinary lithopone, which contains from 0.4 to 2 per cent. of acetic acid-soluble zinc (as oxide) can be "stabilized" by a similar treatment, designed to reduce the acetic acid-soluble zinc to below 0.05 per cent. As to the resin component of the compositions, it is found that those resins which tend towards instability usually have one or more of the following characteristics: high content of combined phthalic acid; relatively high acid value; presence of combined china wood oil or its acids; presence of combined Congo resin. Several examples are given of resin mixtures suitable for combining with the "stabilized" pigments described above. They are all of the glycerol-phthalic anhydride type, and are preferably modified with the acids of linseed oil or china wood oil. A suitable white enamel, for example, was obtained by mixing 42 parts of "stabilized" lithopone, 10.5 parts of Hi-flash naphtha, 32 parts of mineral spirits, and 0.2 part of cobalt linoleate with 15.3 parts of a resin of acid value 50 prepared from glycerol 19.9, phthalic anhydride 36.4, linseed oil acids 31.2, china wood oil acids 12.5 per cent. If products of particularly light color are required the resin should be prepared in an inert atmosphere.—*Synthetic and Applied Finishes.*

Vinyl-Stand Oil Varnishes

Among the various processes aiming at the conversion of vinyl compounds into practicable varnish materials, that involving reaction with a drying oil has received intensive study. When vinyl acetate is subjected to polymerization treatment in the presence of stand oil, a compound is formed from which it is impossible to isolate polyvinyl acetate. Both chemical and physical tests indicate formation of an entirely new substance. Dissolved in white spirit or butyl acetate, products of this type have already reached the commercial stage. In actual practice the vinyl component is polymerized in admixture with a stand oil extract.

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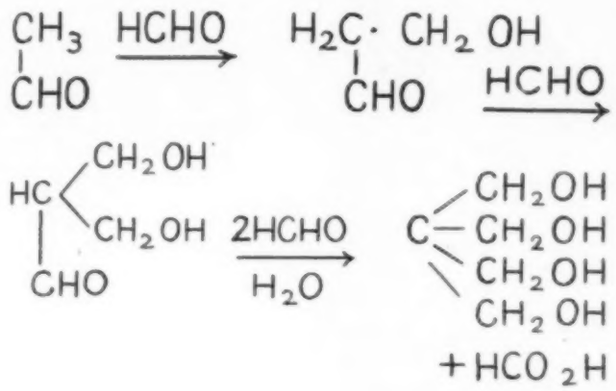
Pentaerythrite Resins

By Dr. S. Malowan

PENTAERYTHRITE has recently become known as a tetrahydroxy alcohol because of the use of its nitro-derivative as an explosive. Because the explosive industry in all countries requires the compound in large quantities, greatest attention has been given its preparation. Pentaerythrite, chemically methyltetramethylol, can be very simply made by the alkaline condensation of acetaldehyde with formaldehyde. Electrochemically, the following reaction occurs:



From condensation by means of lime or soda, pentaerythrite is first obtained in impure condition (yield 80%) with about 30% dipentaerythrite and small quantities of resin. It may also be made by chemical conversion but the yield is poor and the product must be recrystallized several times to raise its melting point from 210 to 238°C. According to Corbellini, lime is the best condensing agent.

The fact that glycerine, a tribasic alcohol, condenses with polybasic acids to give valuable synthetic resins, leads to similar investigations with pentaerythrite. By condensation with polybasic, saturated or unsaturated acids, various valuable products result. These may be used as solvents and softeners, as well as plastics; higher temperatures lead to insoluble and infusible products which range from colorless to dark colored.

The preparation of pentaerythrite ether follows according to a new process: 400 g. pentaerythrite (95%) are heated at 150° C. for 8 hours in an autoclave with 775 g. ethyl chloride, 1400 g. benzine and 500 g. soda. When the reaction is completed, cool the mass overnight, filter, distill off the benzine and distill the residue *in vacuo*. Three fractions result: the fraction from 150-165° C. contains 80% triethyl-and 20% diethylether; from 165-200° C. it contains 20% triethyl- and 80% diethylether. From 200-265° C., the rest of the diethylether and very little monoethyl ether pass over. All the products are light yellow oils of such viscosity that they may be used as solvents or plasticizers for nitrocellulose and cellulose acetate. Nitrocellulose with a fifth of its weight of the diethylether forms a satisfactory plastic mass which can be shaped in the customary manner. The ether itself may be used in lacquer mixtures with or without the addition of dyes or resins.

Another class of substances is formed when 300 parts of pentaerythrite are heated in an autoclave for 20 hours at 125° C. with 500 parts of ethylene oxide and 3 parts of boric acid. The product is a very viscous brown syrup which gives a clear, viscous liquid, insoluble in water, acetone and alcohol, but soluble in most organic solvents. The esterified alcohol has the advantage over polybasic alcohols such as glycol and glycerine with respect to its low hygroscopicity and good lubricating power and promises excellent applicability in the lacquer, paper, dyestuff and textile industries.

Pentaerythrite may itself, and not only through its derivatives, be condensed to resinous products. The ideal form for a synthetic resin suitable for use in lacquers calls for a product which dissolves readily in the cold in the customary solvents and which may be mixed with the usual drying resins if desired. This property is possessed by pentaerythrite resins along with great mechanical stability and heat resistance. They are obtained through a rapid and simple condensation and require only a short hardening period and low temperature to reach an infusible state. The condensation produces products having different properties with respect to solubility, stability and heat resistance.

Heat 31 parts of pentaerythrite with 69 parts of phthalic anhydride at 190° C. to obtain a product soluble in alcohol and acetone. If this is again heated to 180° C. until evolution of steam ceases, the product loses its ability to dissolve in alcohol; if further heated, it becomes insoluble and infusible. Not only phthalic anhydride may be used; various aliphatic and hydroaromatic polycarboxylic acids such as maleic, succinic, adipic, cinnamic and hexahydroterephthalic acids may also be used. All the resins thus obtained have the advantage over the glyptals of not being brittle and may be hardened at moderate temperatures.

Condensation of pentaerythrite with succinic acid occurs after heating for an hour at 140° C. The soluble condensation product formed (A product) is a viscous, colorless liquid which, upon further heating at the stated temperature, is converted into an insoluble, infusible C substance. In this condition it is not affected by water and dilute acids; it is unusually flexible, resistant to heat and produces coatings and lacquers with good adhesive power.

For other properties, resins and oil-like products, pentaerythrite may be condensed with monobasic fatty or resin acids, such as linoleic acid, ricinoleic acid, oleic acid, stearic acid, rosin acid, etc. Heat 65 parts of pentaerythrite and 140 parts of linseed oil with 400 parts of rosin and 5 parts of boric acid for 18 hours in an autoclave at 220-250° C. Afterwards add one per cent. lead-manganese drier and blow air through the mass at 60-80° C. The resulting product is especially suitable for indoor and outdoor lacquering. It may be used with pigments and fillers and possesses the usual good drying properties of mixtures of resins and oils. Condensation products with non-drying acids are desirable for use as plasticizers because of their neutrality, their resinous and oily character, and their compatibility with nitrocellulose.

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Plastics and Coating News

Newark Museum Features Plastics at "Miracles of Chemistry"—Fashion Group Display Opens—Packaging Show Huge Success—Chemical Alliance Appoints Committees—Pyroxylin Shipments Rise—Plastic Molding Creditors' Committee Meets.

Hundreds of new creations in the field of the decorative arts and of fashion which have come in recent years from the chemist's test tubes are being featured in an exhibit at the Newark Museum, under the title: "Miracles of Chemistry: New Discoveries for Industry and the Home. Dramatizing the manner in which the products of industrial chemistry are supplanting the familiar materials of the world about us, the exhibit is attracting national attention.

Plastic products and synthetic textiles that in recent years have found wide use are featured. A living room designed in the modern manner by Donald Deskey, well-known N. Y. decorator, and furnished by materials created by chemistry, occupies an important part of the exhibit. Other features are a group of textiles selected for excellence of design and clothes from the chemist's test tube. Fabrics are being lent for these sections by American Bemberg, Celanese, DuPont Rayon, Galey and Lord, Mallinson & Co., Inc., Tubize Chatillon, and others. Another feature presents the many ways in which chemistry is used in the kitchen. The Museum's entire 2nd floor containing approximately 10,000 square feet of exhibit space is devoted to the exhibit.

Among the first firms to offer cooperation were E. I. DuPont, Celanese, Bakelite, Beetleware, E. R. Squibb & Sons, Celluloid, Westinghouse Electric, Public Service Electric and Gas, Texas Gulf Sulphur, and others. Among those who are acting in an advisory capacity to the exhibit, are Dr. Edward C. Worden of the Worden Laboratories, Professor William T. Read, Rutgers, Dr. John H. Schmidt, Chairman of the North Jersey Section of the American Chemical Society, Dr. Carleton Ellis of the Ellis-Foster Laboratories, Professor James A. Bradley, Dean of the Newark College of Engineering, and the State of New Jersey Agricultural Experiment Station.

Special educational features of interest to the general public are being scheduled for the duration of the exhibit. A series of speakers prominent in the field of industrial and research chemistry are giving talks explaining various aspects of the exhibit. A series of educational moving pictures dealing with chemistry is being shown. The "Miracles of Chemistry" exhibit will remain at the Newark Museum opposite Washington Park, Newark, N. J., for 2 months or more.*

Fashion Group Displays

"Fashion-right," scientifically created fabrics, clothes, and decorative products made by American workers and design creators and selected by the country's leading fashionists will go on exhibit in The Fashion Group gallery at 30 Rockefeller Plaza, Rockefeller Center, Apr. 2. Exhibition under the sponsorship of The Fashion Group, and free to the public, will continue until April 29.

A jury representing 423 members of The Fashion Group, who hold outstanding feminine positions in American industrial and commercial fashion fields, will judge the good taste and beauty of each object to be shown. All of the fashions or house furnishings displayed will be made primarily of a basic material unknown to the world half a century ago.

Each of a series of some 50 "theme pictures of eminently fashion-right results in contemporary creativeness" will be displayed. Each "scene" will be contributed to by the great textile and plastic industries of the U. S. represented by such companies as Dupont Rayon, Viscose, Tennessee-Eastman, Bakelite, American Enka, American Bemberg, American Glanztoff Tubize Chatillion, Revolite, Formica Insulation, and Skenandoah Corp.

Instead of customary exhibition booths, there will be "scenes" representing contemporary occasions and episodes in modern living such as "A Dinner Party", "Gymnasiums for Chic," "At The Races," "A Millionaire Beach Club," "Dude Ranch Proprieties," "A Rainy Day," "Al Fresco Dining," "Small Talk During Intermission," "Relaxation in the Grand Manner."

Marion C. Taylor, of *Vogue*, is chairman of The Fashion Group Exhibition Committee. Alice Sharkey, widely known in decorative and industrial arts, is director of the exhibit, and Eleanor LeMaire, its designer and architect. Members of the Committee include Mrs. Margaret Dar-

*Included in list of exhibits being shown are the 300 new chemicals produced by advertisers in CHEMICAL INDUSTRIES and PLASTIC PRODUCTS which attracted such wide attention at the recent Chemical Exposition. New Jersey's production of chemicals is second only to that of N. Y. State and it is the state's most important industry. Williams Haynes, publisher of CHEMICAL INDUSTRIES and PLASTIC PRODUCTS has written a special brochure relating the importance of New Jersey in the field of industrial chemistry specially for the exhibit.

January Paint, Varnish and Lacquer Sales

Sales of paint, varnish and lacquer products in January totaled $20,643,659 in value, against $16,156,062 in Dec. '33, and $11,275,396 in Jan. '33, (586 establishments). January's sales were the largest of any month since last July. Classified sales (by 344 establishments) indicated that $6,015,030 was sold through industrial channels and $7,470,517 through trade channels.

	Total sales reported by 586 establishments	*Classified sales reported by 344 establishments*				*Unclassified sales reported by 242 establishments*
		Industrial sales			*Trade sales of paint, varnish and varnish*	
		Total	*Paint and varnish*	*Lacquer*		
1934—January	$20,643,659	$6,015,030	$4,290,923	$1,724,107	$7,470,517	$7,158,112
1933—Jan.	$11,275,396	$3,529,886	$2,386,947	$1,142,939	$4,168,260	$3,577,250
Feb.	11,665,734	3,423,033	2,445,378	977,655	4,771,706	3,470,995
March	13,578,568	3,391,947	2,484,550	907,397	5,788,213	4,398,408
April	19,043,787	4,677,309	3,143,803	1,533,506	8,582,411	5,784,067
May	26,241,044	5,991,938	4,298,455	1,693,483	11,788,573	8,460,533
June	27,813,233	6,827,509	4,832,551	1,994,958	12,443,998	8,541,726
July	22,090,187	6,406,184	4,493,516	1,912,668	8,627,400	7,056,603
August	20,620,811	6,323,475	4,754,701	1,568,774	7,840,359	6,456,977
Sept.	19,097,803	5,544,686	3,975,917	1,568,769	7,462,113	6,091,004
Oct.	18,944,106	4,949,755	3,721,420	1,228,335	7,376,012	6,618,339
Nov.	16,234,234	4,656,353	3,466,174	1,190,179	6,566,157	5,011,724
Dec.	16,156,062	4,418,023	4,428,376	989,647	6,157,567	5,580,472
Totals	$222,760,965	$60,140,098	$43,431,788	$16,708,310	$91,572,769	$71,048,098
1932—Jan.	15,894,506					
Feb.	16,270,822					
March	19,089,005		Comparable data not available			
April	22,612,193					
May	24,981,441					
June	19,637,358	4,685,399	3,617,719	1,067,680	8,734,330	6,217,629
July	14,430,122	3,793,245	2,900,707	892,538	6,058,813	4,578,064
Aug.	16,032,441	3,851,028	3,057,096	793,932	6,918,659	5,262,754
Sept.	16,805,712	3,980,564	3,113,303	867,261	7,216,748	5,608,400
Oct.	15,592,377	3,996,500	3,036,323	960,177	6,610,011	4,985,866
Nov.	12,492,818	3,599,319	2,639,562	959,957	5,196,766	3,696,733
Dec.	9,484,520	3,222,770	2,186,706	1,036,064	3,506,715	2,755,035
Totals	$203,323,315	.....	.....	.....	.....	.....

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by **LOUIS F. RAHM**

Assistant Professor of Mechanical Engineering, Princeton University

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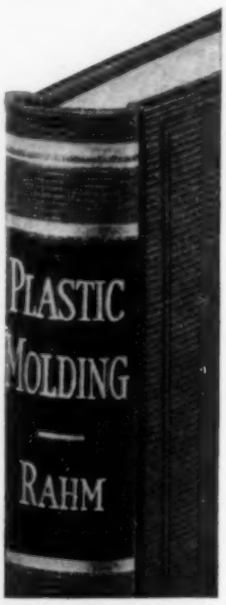
If you are a manufacturer, you will get from this book help on all sorts of plastic molding problems. You will secure a manual of best methods.

If you are a user of plastic products, you will get from this book priceless suggestions for the more efficient selection and adaptation of these products.

The author has had wide practical experience through his connection with the Du Pont Viscoloid Company and the Burroughs Company. Under the Robert Stewart Brooks Fellowship at Princeton, he made a survey of the methods and equipment of the leading molding plants in the country. His book is an authoritative manual for the entire plastic molding industry—the first to be devoted exclusively to molding processes, equipment and methods.



CONTENTS: I—The Molding Process and the Plastics. The Molding Process. The Plastics. **II—Molds.** Types and Uses. Style. General Design Details. Special Details. Die Hobbing. **III—Operating Equipment.** Molding Presses. Accessory Equipment. **IV—The Molding Plant.** Plant Equipment.

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Exhibitors and Exhibits

Bakelite will exhibit both molded and laminated objects as diverse as storm, humidity and air guides, clocks, watches, binoculars, massage equipment, candle holders, picture frames, vases, costers, cigarette cases, radios and kitchen utensils, tables and lamps. Bakelite, through its laminated division, will also show card tables developed with "zalmite" tops; beer steins insulated with dry zero—a substance made from anodic aluminum and Bakelite laminated. Transparent resinoids to be displayed by this company will include cutlery, pencils, salt and pepper shakers. In the "At the Opera" Scene will appear, for example, a laminated cane with resinoid handle. Throughout the exhibit will be scientifically produced jewelry from Bakelite, Catalin, Galalith, and various rhinestone and man-made pearl jewelry firms.

Pressed and vulcanized laminated products from Formica Insulation will appear in the exhibition in the form of bars for private houses, tables by Donald Deskey, and other objects important not alone for their decorativeness in surface and coloring but because of their exceptional chemical inertness which withstands contact with liquids and atmospheric conditions.

Formica products will also appear in new background identities in the actual construction of the exhibition, replacing marble and glass with materials that do not easily break, chip or crack, and which resist heat. Variously designed sheets, tubes and molded shapes will appear in the exhibit.

Many of the "man-made" plastic exhibits will be shown to consumers for the first time in The Fashion Group exhibition. Among these debut presentations will be Revolite fabrics. DuPont Cellophane will appear in many new roles in the Fashion Group's "Man-Made" show. It will be used extensively for background, and for objects as diversified as hats and lamp shades, chair upholsteries and hand-bags, gloves and window curtains. Fabrikoid also will be widely seen in handbags, luggage, books, and decorative accessories. Tenite (Eastman cellulose acetate) will be shown in smart desk sets, ashtrays, and cigarette lighters, styled automobile accessories, and boudoir and handbag compacts and other toiletries.

N. Y. Curb Exchange has admitted to the list the 536,964 shares of Catalin Corp. of America (par $1).

COMING EVENTS

Fashion Group, "Fashions and Interior Decorations Developed in Man-Made Materials, 30 Rockefeller Plaza, Rockefeller Center, March 15-April 14.

Industrial Arts Exposition, National Alliance of Art & Industry, 30 Rockefeller Plaza, Rockefeller Center, April 1-30.

Fourth Annual National Premium Exposition and Convention, Palmer House, Chicago, May 7-11. A. B. Coffman, Exp. Mgr., 35 East Wacker Drive, Chicago.

4th Packaging Show Awards

Red Circle Coffee Bag, entered by American Coffee Corp., sold by A. & P., designed by Egmont Arens of Calkins & Holden, won the 3rd Wolf Award (a pair of tall, drigold vases), at the 4th Packaging Exposition at the Hotel Astor on March 14. Fifteen additional awards were made in various classes. First place in molded plastic containers went to the hostage package for Lektrolite Cigarette lighter, used by Platinum Products, and designed by Egmont Arens, and made of Catalin, (American Catalin Corp.). First in Canisters class was a boric acid container designed, entered and used by Montgomery Ward. Valentine & Co.'s self-stirring paint can was picked out from a large number of entries in the group "Displaying Merchandizing Ingenuity Regardless of Adaptation of Art." In the miscellaneous group display stand (Hinde & Dauch), used by Paint Process, and designed by H. L. Kast was selected. "Linit" (Corn Products Refining) was the '31 Wolf Award winner; last year's winner—O'Cedar Wax Cream. Durez cap was used on winning collapsible tube entry. (Photographs, Rotogravure Section).

Alliance Appoints

Executive committee of the Chemical Alliance has already set up a large part of the necessary machinery for future smooth operation. Officers of the Code Authority are: Chairman, William B. Bell, Cyanamid; vice-chairman, Charles Belknap, Merrimac; Willard H. Dow, Dow Chemical; Lammot du Pont; treasurer, J. W. McLaughlin, Carbide; secretary, Warren N. Watson, M. C. A. secretary; acting code director, Howard Huston, assistant to Cyanamid's president.

Four committees have been named to date. Their personnel are: Statistics—George W. Merck, chairman, E. V. O'Daniel, W. H. Winans. Explanations—E. M. Allen and H. C. Haskell; Supplemental codes and overlapping codes—A. E. Pitcher, of du Pont Viscoloid, chairman, Glenn Haskell, U. S. I.; and Fred Russe, Mallinckrodt. Import Competition—H. M. Albright of U. S. Potash, chairman, Harry L. Derby and W. F. Reich.

A Competitor Talks on Plastics

At a recent American Ceramic Society meeting at Cincinnati a paper on plastics vs. ceramics was read by F. P. Hall, Onondaga Pottery, Syracuse, N. Y. Mr. Hall cited the development of plastics from an industry having a status of $14,000,000 in '14 to one of $224,000,000 in '28. The term plastic is now applied to a class of chemical products which are convertible into permanent shape as the result of chemical reactions produced by the influence of heat and pressure in a short period of time. Multiple cavity molds in 200 or 300 ton presses are today capable of producing as many as 25,000 pieces on one press per 8 hour day. The impact strength of molded phenolics, Mr. Hall said, is from 3 to 4 times greater than for glass or porcelain, but surface hardness of the latter is much greater than for the hardest plastics made today.

"Plastics are not so stable under varying temperatures as ceramic products", Mr. Hall stated. "At room temperature with relative humidity at approximately 50% plastics made today are in equilibrium. Changes in the relative humidity brings volume changes in the plastic but in the case of phenolics which are elastic this change does not result in damage." However, Mr. Hall pointed out, in the case of urea plastics which are relatively inelastic such changes are often damaging especially if the item considered is not uniformly "cured" and of low water absorption.

Porosity, low weathering resistance, and low arcing resistance of plastics, he said, make them practically worthless as insulators for exterior work.

G. E. Financial Report

Forty-second annual G. E. report for '33 shows profit available for dividends of $13,429,739, equivalent, after dividends of 6% on special stock, to 38c per share on 28,845,927 shares of no par value common stock, compared with $14,404,110, or 41c per share, on the same number of shares in '32. These figures are the same as the preliminary earnings released on Mar. 2. Dividends of 60c per share on the special stock and 40c per share on common amounted to $14,112,633, resulting in a deficit from operations of $682,894, which was taken from surplus.

At the A. C. S. Meeting

Economist Earl L. Smith, Webber College, Babson Park, Fla., reporting on the state of trade of chemical and allied industries before the recent A. C. S. St. Petersburg meeting, stated: "Plastics, films, and synthetic resins are also showing gains over a year ago." E. E. Ware, director S-W's varnish research, discussed "The Trend in Protective Coatings."

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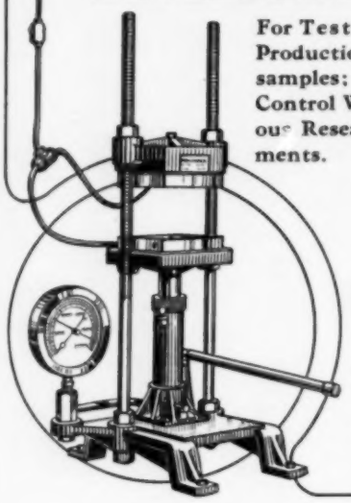

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The link between farm and industry is strikingly revealed in the manufacture of nitrocellulose. Made from cotton, the use of nitrocellulose in any form (plastics, sheets, lacquers) gives the farmer one kind of aid he appreciates — a market for his cash crop.

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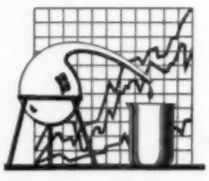

73 NEWBURY ST., BOSTON

New British Chemicals

British chemical industry interest in the past month centered in the British Industries Fair (Feb. 19-Mar. 2). Number of new chemicals and several chemicals but just recently produced in the Empire featured the exposition. Titanium pigments were accorded place of honor. Pigment contains approximately 82% titanium oxide, and 18% barium sulfate. The 2 are precipitated together under special conditions. Use of titanium pigments in a number of industries beside paints is gaining in Great Britain. At present 5,000 tons are consumed as compared with 75,000 tons in U. S. Decahydronaphthalene is a powerful solvent produced by hydrogenation of naphthalene. It is cheaper than turpentine and in many cases can be used as a substitute. It is recommended for synthetic varnishes. I. C. I. displayed "Seekay" wax—a flame-resisting wax and bleaching agent. Plastic industry made a splendid showing. Space taken exceeded last fair by 25%.

Coatings

Federal Trade Commission will begin taking testimony Apr. 6, in its case against Duralith Corp., N. Y. City, distributor of plastic paints, charged by the Commission with carrying out a fraudulent sales plan in selling its product, "Duralith." Hearing Apr. 6 will be held in Columbus, Ohio, Room 34, U. S. Post Office Bldg., at 10 a. m., before Edward M. Averill, Commission trial examiner. James M. Brinson will be the Commission's attorney.

It is charged that as a part of the company's sales plan, Duralith solicited sales of its product to distributors, and obtained their signatures to commercial paper upon fraudulent representations, among which was that the paper would be held by Duralith Corp. until maturity and until the distributors could pay for it out of resales of its product to dealers and consumers.

It is also charged that as a part of this sales plan, Duralith, having received this commercial paper, instead of holding it as represented, transferred the paper to finance companies which demanded and in some cases exacted payment.

Personnel

Kenneth E. Burgess, formerly Zapon's technical director, later in charge of Van Schaack's lacquer division, is now (as a result of its purchase by Ault & Wiborg) with the technical division of A. & W. J. C. Mullins has been reelected General Paint president. A. J. Manby is now with Allied Finishing Specialties, Chicago, as director in the manufacture of lacquer finishing materials. H. Dale Thieben has joined the technical staff of Rinshed-Mason, Detroit lacquer producer. E. V. Peters, St. Joseph Lead's zinc oxide sales manager, has been made a vice-president. He was one time with N. J. Zinc.

Recoveries

T. J. McConnel, president, Cincinnati Paint, Oil and Lacquer Club, is back fully recovered. Ludington Patton, vice-president in charge of Pittsburgh Plate Glass' Milwaukee paint and varnish division, is recovering in Miami from a heart attack.

With the Associations

Bakelite's Robert J. Moore and Mellon Institute's Dr. E. R. Weidlein were speakers Mar. 15 at a joint meeting of the N. Y. Paint, Varnish and Lacquer Association and the N. Y. Paint and Varnish Production Club held at the Biltmore. Beck, Koller's A. Hovey is a new member of the Detroit Production Club. At the March meeting Dr. C. A. Knauss, Nuodex Products (Newark driers producer) was the guest speaker.

S.-W.'s research director, Dr. C. D. Holley, spoke on paint troubles March 5 before the Chicago Paint & Varnish Club. W. F. Fenton, who succeeded to the presidency on the death of President Seder, presided. C. A. Klebsattel, Advance Solvents & Chemical, will speak at the April meeting. A National Retailer's Association has been launched with Leo E. Schroeder, George E. Watson Co., Chicago, as president. N. P. V. & L. A. is cooperating. Arthur F. Winstel, president, Saeger-Winstel, Cincinnati, was elected president of the National Wholesale Paint Association recently.

Beck, Koller's New Oil

Beck, Koller has an interesting new product—"Katalized Tung Oil." Literature states that it will dry with greater degree of tactfreeness and with better gloss, as well as much harder and faster, than air dry finishes made with heat bodied linseed oil. Paint made with it has exceptionally good washable properties.

Beck, Koller has scheduled a 2-day sales conference in Detroit Apr. 13-14 All sales representatives will attend.

"Briefly Speaking"

E. A. Bradley, well-known in Pacific Coast paint circles, has formed "E. A. B." Paint Co. at Los Angeles. Sherwin-Williams' had 500 out on strike Mar. 19. Said Vice-President H. J. Hain: "We realize that as soon as the 36-hour week goes into effect we must make another general advance." He also declared that an increase was granted on Jan. 1 and a 30% increase had been granted since last September.

H. B. Fleming has leased plant of the Factory Consumers Paint, Buffalo, and will start production.

Lane Joins Hercules

Frederick H. Lane has joined Hercules as a consultant on protective coatings. He is also making a survey for Binney & Smith on the use of their protective coating products.

Cellulose

Theft of practically all of the articles and samples displayed in Celluloid's booth at the Packaging Exposition was made known Mar. 20. Items were various articles wrapped in Protectoid, Celluloid's cellulose acetate transparent wrapping material, and samples of the material itself. The items were pilfered from a large carton in which they were packed after the close of the Exposition. W. S. Landes, president of Celluloid, placed the extent of the loss at about $500.

Cellulose Plastic Products

(Nitro Cellulose and Cellulose Acetate Sheets, Rods and Tubes)

January, 1934

Compared with preceding months

The Bureau of the Census presents, in the following table, monthly statistics on production and shipments of cellulose plastic products (sheets, rods, and tubes) for January, 1934, based on data furnished by 10 identical manufacturers. Statistics are also shown for 8 identical manufacturers from January to July, and for 10 identical manufacturers from August to December, inclusive, 1933. Segregated data for nitrocellulose and cellulose-acetate products, are not available prior to January, 1933. This report takes the place of the monthly report on "Pyroxylin Sheets, Rods, and Tubes."

Production and Shipments (Pounds)

	Nitro-Cellulose						*Cellulose-Acetate*	
	Sheets		*Rods*		*Tubes*		*Sheets, Rods, and Tubes*	
Year & Mo.	*Production*	*Shipments*	*Production*	*Shipments*	*Production*	*Shipments*	*Production*	*Shipments*
1934								
January	734,085	701,581	138,500	160,081	75,106	67,853	357,836	377,346
1933								
January	504,813	625,392	74,872	115,434	12,812	29,329	167,856	160,272
February	490,290	593,942	78,904	100,092	16,248	25,711	141,628	125,073
March	454,506	611,840	63,188	87,784	17,472	32,525	119,400	117,344
April	473,333	624,727	104,817	130,853	26,198	27,091	149,402	211,435
May	787,614	774,424	161,784	126,195	32,684	36,992	234,811	221,345
June	912,742	959,194	156,830	139,772	41,467	45,057	242,013	220,686
July	1,027,812	916,612	158,250	160,851	42,100	41,467	192,381	221,751
August	1,290,521	1,257,981	254,249	236,730	40,364	56,142	230,013	231,879
September	1,307,052	1,158,080	241,558	232,725	49,263	58,962	213,996	229,629
October	1,056,328	991,557	254,375	216,191	76,291	69,258	207,327	217,892
November	641,059	827,544	189,668	134,750	78,712	63,967	257,872	278,774
December	562,152	944,821	163,317	183,471	72,328	92,673	325,412	352,362
Total(year)	9,508,222	10,286,114	1,901,812	1,864,848	506,039	579,174	2,482,111	2,588,442

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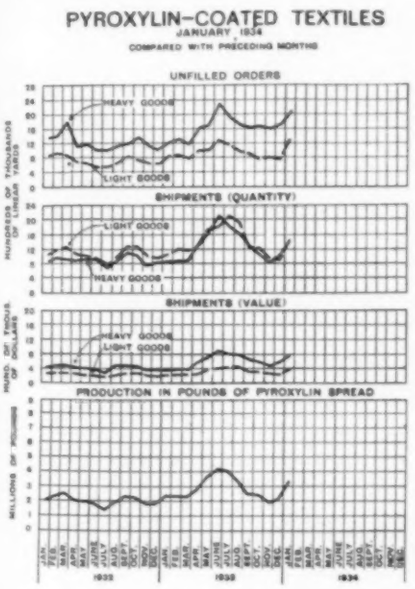
"However," said Mr. Landes, "there are several more important considerations than the money involved. Many of the cartons and articles wrapped were borrowed from our customers and we naturally promised to take good care of them. Furthermore, I fail to see how these things would be of any use whatsoever to anyone except somebody particularly interested in new developments in Protectoid."

The stolen articles contained several examples of the new heavy gauge Protectoid and commercial applications of it. These samples had never before been shown.

Production Data

Following table presents monthly statistics relating to pyroxylin-coated textiles based on data reported to the Bureau of the Census by manufacturers comprising most of the industry. The data include products manufactured by spreading nitro-cellulose or pyroxylin preparations, either by themselves or in combination with other materials, upon grey goods, such as sheetings, drills, ducks, sateens, moleskins, etc.



	1934 January	*1933 December*
NUMBER OF MFRS REPORTING	20	19
LIGHT GOODS:		
Shipments—		
Linear yards	1,477,513	1,071,274
Value	$377,531	$290,874
Unfilled orders (a)—		
Linear yards	1,295,953	791,533
HEAVY GOODS:		
Shipments—		
Linear yards	1,398,253	1,077,104
Value	$773,428	$605,929
Unfilled orders (a)—		
Linear yards	2,087,217	1,807,782
PYROXYLIN SPREAD (a):		
Pounds	3,283,049	2,350,880
MONTHLY CAPACITY (c):		
Linear yards	12,822,689	12,372,689

(a) Orders on hand at the close of the current month (reported in yards only) exclusive of contracts with shipping dates unspecified.

(b) Based on 1 lb. of gun cotton to 7 lbs. of solvent, making an 8-lb. jelly.

(c) Based on a maximum quantity of 1.27 to 1.30 sateen, coated to a finished weight of 17½ ounces per linear yard, in a 24-hour working day, 26 days to a month.

For Fountain Pens

A new step in the convenience of the fountain pen has been made possible through the transparent qualities of pyroxylin plastic. Some years ago this material was adopted almost exclusively for fountain pens. Manufacturers have now found that the transparent plastic permits a pen which allows the writer to see the amount of ink in the reservoir and thus avoid the former annoyance of not knowing when the ink was exhausted.

Some interesting combinations of color are being used for the new pens, Du Pont Viscoloid reports. In one instance the barrel is made of silver pearl with a silver pearl and black cap. There is also a transparent burgundy pearl with a cap to correspond. Other colors for this new trade are being developed.

"Not So Good"

Massachusetts House, without debate, accepted an adverse committee report on the bill to require use of non-shatterable glass in all motor vehicles.

Personal

L. B. Cavanagh, Standard Tool, Leominster, Mass., was in Miami during February and part of March. Other visitors to the South included Celluloid's Hill and Boonton Molding's Scribner.

Will Buy Home Products

Woolworth's have discontinued sale of German-made materials because of sales resistance Cheap novelties are affected and purchasing will largely be done in this country. Macy's (N. Y. City's largest department store) has closed up its Berlin purchasing office.

Glyco Appoints

Technical Service Bureau, 6805 N. Clark st., Chicago, has been appointed to serve Glyco Products' accounts in Illinois, Wisconsin and Northern Indiana. Personnel of the Technical Service Bureau is under the technical supervision of Clyde A. Crowley, consulting chemist.

Tariff Commission has just released "Statistical Study of N. Y. Imports in 1933 of Chemicals (not specially provided for in the Tariff Act of 1930)."

Company Booklets

No. 37. Bakelite Corp., 247 Park ave., N. Y. City. Sixth edition of this now famous booklet contains 48 pages and describes in detail Bakelite molding materials and their uses, and gives a brief description of the molding process and needed equipment. It is magnificently illustrated and really is in the nature of a textbook.

No. 38. Bakelite Corp. Molders and others will find "Bakelite Molded Stock Colors" actually shown in true color a very useful chart to have filed away.

No. 39. Brown Co., Portland, Me. *The Salka Age*, monthly magazine of the Brown Co. while a comparative newcomer in the field of house-papers has already jumped into the front rank with the leaders. February issue contains a most interesting and instructive article on Eastman Kodak's plant. Several additional articles deal new and novel uses for "Solka" purified cellulose.

No. 40. Eastman Kodak Co., Rochester, N. Y. Eastman has issued a new price catalog for Eastman organic chemicals. Every purchaser of chemicals should have this price-list on file.

No. 41. Givaudan-Delawanna, Inc., 80 5 av., N. Y. City. *The Givaudanian* is a newcomer, but one that is finding wide favor for its "newsy" comment and practical information on manufacturing topics. February issue features "Resins Were the Perfumes of the Orient—They Still are Fixatives." In the industrial section is featured "Deodorized Plastics Solves Sales Problems"; also deodorized paints and enamels and deodorized fabrics. Sense of smell is rapidly being made use of in selling appeal in industries that never dreamed that odor would play a part.

No. 42. Glyco Products Co., Bush Terminal Bldg., Brooklyn. Latest copy of the Glyco catalog is now off the press. It deals extensively with emulsifying agents, synthetic resins and waxes polishes, sprays, etc.

No. 43. Halowax Corp., 247 Park ave., N. Y City. An attractive folder which describes "What Halowax Is and What Halowax Does" (flame proofing, compound polishes, protection against corrosion, as a plasticizer, etc.).

No. 44. Hercules Powder Co., Wilmington, Del. "Hercules Chemical Cotton—Best Source of Cellulose" is a 30-page authoritative story of the manufacture, uses and methods of testing chemical cotton. Splendidly illustrated.

No. 45. Hercules Powder Co. *Hercules Mixer* for February features "From Cotton Field—To Camera Film"; describes "Tornesit" new chlorinated rubber of interesting uses and future possibilities; plus the useful inter-company news.

No. 46. Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh. An index of products made by Pittsburgh Plate Glass and subsidiaries and a directory of plant locations and sales and servicing stations.

No. 47. Superez Corp. of America, Cumberland, Md. "Superez" is a new denture resin of interesting properties.

No. 48. Dow Chemical Co., Midland, Mich. Entire metal trades, even industries working in metals in smaller degree, will be glad to know of this new Dow metal data book. It explains how this world's lightest structural metal may be fabricated by processes common in industry. A description is given of accepted shop practice. Various available forms of Downmetal are listed and described, such as sand or die castings, extruded shapes, forgings, sheet, plate and strip. Methods of welding, riveting, forming, machining are discussed in detail, with much information on designing and finishing. This new data book is altogether the most informative and enlightening document on the uses, properties and fabrication of the lightest of all the structural metals, which is so rapidly taking an important place in manufacture.

No. 49. General Electric Co., Schenectady, N. Y. "Improving Power Factor For Profit—G. E. Capacitors Pyranol-treated" is a 29-page booklet which treats the subject exhaustively. Because of low power-factor, hundreds of industrial plants and other users of large amounts of electric power are actually buying much more current than would be required to do the same amount of work if the power-factor were higher. Inasmuch as this can be improved easily and economically, it is needless for these users of electric power to permit such a condition of economic waste to exist year after year in their plants. This booklet is the answer.

No. 50. General Electric Co. GEA-1520B is a 50-page catalog of electric heating units and devices, together with necessary engineering data.

No. 51. Luken Steel Co., Coatesville, Pa. A brand new specially well-illustrated booklet on "Lukens Nickel-Clad Steel in the Process Industries."

No. 52. John Robertson Co., 121 Water st., Brooklyn. March *Robertson-Reminders* contains special data on high pressure pumps together with information on the general Robertson line.

No. 53. Westinghouse Electric & Manufacturing, East Pittsburgh, Pa. Three publications just issued describe the new line of fractional horsepower motors with many improvements over preceding designs.

No. 54. Worthington Pump and Machinery Corp., Harrison, N. J. This company has released several new leaflets including a description of Type VA-2 Air Compressor Unit.

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Several Smaller Machines, Power and Hand.

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STILLS—4—Copper, Steam Jacketed Stills, 500, 150, 50 gals.

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Claremont Waste Mfg. Co.

CLAREMONT, N. H.

Bureau of Chemistry & Soils has succeeded in isolating 2 constituents of the natural wax of apple skins. Ursolic acid imparts hardness to lacquers and nonacosane increases impermeability. American Cyanamid has applied for a patent on a method of recovering ursolic acid and Celanese Corp. has an application covering the use of nonacosane in lacquers to increase impermeability.

Machinery

For controlling viscosity of such materials as fuel oil, lacquers, varnishes and other coatings, lubricating oils, sizes, printing inks, adhesives and other materials, Merritt Engineering & Sales Co., Lockport, N. Y., has introduced a new tank-type viscosity regulator consisting of a slowly rotating paddle within a tank, paddle being driven through a special transmission operating a dilution valve. Any increase or decrease in viscosity is measured by the transmission and this impulse is used to adjust a needle valve to decrease or increase the flow of thinning solvent. In most cases, according to the manufacturer, viscosity can be controlled within 2½% of that for which the regulator is set. Instrument may also be used for indicating and recording the viscosity of process solutions.

Phenolic resin molding compound is employed in the acid- and moisture-proof case of a new pressure gage recently introduced by the Consolidated Ashcroft Hancock Co., Bridgeport, Conn.

Kennedy Now Chairman

Paul S. Kennedy has taken over the chairmanship of the National Industrial Sales committee of N. P. V. & L. A., recently vacated by Ault & Wiborg's Joseph R. Esposito. Latter remains as a committee member. An active program was recently formulated at a Washington meeting.

Benzol Statistics

U. S. '33 benzol exports totaled 8,439,456 gals., valued at $1,594,075, compared with 3,241,317 gals., valued at $611,656, in '32, according to C. C. Concannon, Chief, Chemical Division, Bureau of Foreign and Domestic Commerce.

Some shifts have occurred in the markets for American benzol, Mr. Concannon stated. Shipments to the Central and South American area increased 20% compared with '32, Argentina taking 71,000 gals. of a total of 130,000 gals. shipped to that area. Consignments to the Far East practically quadrupled in '33 compared with the preceding year, largest Far East purchaser being Japan which purchased 1,309,000 gals. compared with 374,477 gals. in '32.

European purchases more than doubled, leading countries of destination being France with 4,692,340 gals., U. K., 915,452 gals., and Germany 867,933 gals. Importance of the European market for American benzol, Mr. Concannon pointed out, is apparent from the fact that in '33 approximately 13% of the total American output was sold abroad and of the total American exports 80% was destined to European countries.

U. S. benzol production, estimated from the production of coke at by-product ovens known to recover benzol, amounted to 61,858,000 gals. compared with a production of 45,668,000 gals. recorded for '32, 80% of which entered the motor-fuel field.

Within the past few years production of nitrocellulose lacquers in the Netherlands has expanded and imports of these products have been somewhat curtailed, according to a consular dispatch to the Department of Commerce. At present there are 6 concerns manufacturing lacquers. In '32 total imports of nitrocellulose lacquers into Netherlands amounted to 219 metric tons and for '33 totaled 200 tons.

Laminated

Macerated Celoron is the material used in the female end of a new sprocket-type coupling announced by Continental-Diamond Fibre, Newark, Del. The metal sprocket is completely enclosed by the Celoron portion so that there are no projections to cause possible danger. Coupling is extremely light in weight, serves as an electrical insulator between motor and driven machine and is available in 7 sizes for carrying up to 85 hp.

Wright On NEMA Board

J. P. Wright, of Continental Diamond Fibre, Newark, Del., is a member of the NEMA board of governors.

Molded

NEMA molded insulation group met Mar. 30 at N. Y. City headquarters. After transaction of routine business group discussed in detail question of enforcing code regulations. In addition to Chairman Scribner, Boonton Molding those present included: A. L. Steinberger, Insulation Manufacturing; Harry M. Burt, Royal Molding; A. S. Blackinton, Associated Attleboro; Hans A. Wanders, Northern Industrial Chemical; T. E. Giblin, G. E.; Frank H. Shaw, Shaw Insulator; S. Parker, Union Insulating; J. B. Neal, Norton Laboratories; and Leo Adanbaum. Guests included A. L. Steinberger, Leo Adanbaum, and R. C. Gilmore, Jr., Plastic Products.

Walker With Plastic Molding

A reorganization of the personnel of Plastic Molding has been made, and George Walker, has resigned his connection with Garfield Manufacturing (he went with this company in 1918), to become president and general sales manager of the corporation with complete charge of all financial, manufacturing and selling activity. No change was made in the office of treasurer or secretary. W. T. Cole remains as treasurer and G. M. Stuart as secretary. John W. Anderson is plant superintendent. A satisfactory arrangement has been made with the creditors' committee and the committee is urging acceptance of the plan. Accounts up to $50.00 will be paid in cash within 3 months from the date of acceptance of the plan by the creditors. Accounts between $50.00 and $100.00 will be paid within 6 months. All accounts over $100.00 will be taken up through a 6% note issue payable at the Bridgeport-City Trust Co., the 1st 20% to be payable Apr. 1, '35 and the balance in equal yearly payments through '39. Payments will be anticipated if the funds of the company warrant a prepayment. Plastic Molding does both hot and cold molding and the plant and equipment are in splendid condition. Plant has continued to operate in cooperation with the creditors' committee.

General Plastics recently used the *Buffalo Courier* (leading Buffalo, N. Y. daily) to spread the story of Durez's use in the motor car industry. "The Heart of your Ford V-8" was the caption leader employed underneath a close-up view of the ignition. Then followed a detailed explanation of the many vital automotive parts where plastic materials have proven indispensable.

Dr. Arthur J. Norton, General Plastics, spoke at a round-table discussion of "Should Chemists Be Licensed" at recent meeting, Niagara chapter, American Institute of Chemists. National Aniline's James Ogilvie reported on compulsory system of organization built up in England.

Over 900 attended Mar. 1 meeting of NEMA to discuss code amendments. Only a handful of molding company representatives were at the Commodore.

Hercules Elects and Appoints

At Hercules annual directors' organization meeting L. N. Bent was elected vice-president and a member of the executive committee relieving T. W. Bacchus on the committee. Mr. Bacchus continues as vice-president and member of the board. Mr. Bent who was general manager of the naval stores dept., is succeeded by A. B. Nixon, formerly head of the cellulose products dept. Mahlon George Milliken will fill Mr. Nixon's place. Mr. Milliken was superintendent of the company's nitrocellulose plant at Union. E. F. Thoenges, assistant superintendent moves up into the superintendency.

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Plastic Patents

Cellulose

Alkoxyalkacyl esters of cellulose. No. 1,940,709. H. Dreyfus, London.

Mixed alkacyl-alkoxyalkacyl esters. No. 1,940,710. H. Dreyfus, London.

Solid agglutinant, of acetyl cellulose collodion wool and ethyl acetanilid. No. 1,941,958. W. Stehlkens & R. Muller to Boehringer & Soehne.

Esterification of cellulose by organic acid anhydrides. No. 1,943,507. H. L. Barthelemy, Milan, to Ruth Aldo Co., Inc. N. Y.

Cellulose ethers for low viscosity solutions. No. 1,944,896. A. S. Levesley & F. C. Randall, to Imp. Chem. Ind., Eng.

Oil-bitumen impregnated paper product. No. 1,944,907. F. H. McCormick & G. L. Schwartz, to du Pont Co., Wilmington.

Process for integral continuous tubing of cell. material. No. 1,944,970. O. W. Dieffenbach, Baltimore, Md.

For mfr. of nitrocellulose. No. 1,945,101. E. Tschudin, Reinach, Switz.

Multiply fibers with rubber latex forming art. leather. No. 1,945,173. F. O. Woodruff, to Beckwith Mfg. Co., Boston.

Refined cell. fibers from hemp, jute, ramie sisal etc. No. 1,945,202. G. A. Richter, to Brown Co., N. H.

Esterification and acylating agent. No. 1,945,310. R. E. Fothergill & F. C. Hahn, to du Pont Co., Wilmington.

Artificial fabric—cell. material and starch. No. 1,945,537. G. L. Schwartz, to du Pont & Co., Wilmington.

Variations in ester and treatment in making coated papers. Nos. 1,945,203-4-5. C. L. Gabriel, to Comm'l Solvents Terre Haute.

Nitrocellulose and plasticizer for mfr. of tracing paper. No. 1,945,338. H. M. Spurlin to Hercules Powder Wilmington.

Acyl halide process for mixed esters of cell. No. 1,946,632. Carl J. Malm, to Eastman Kodak, Rochester.

Cell. composition, ester with derivatives of diethylene glycol. No. 1,946,235. T. F. Murray & W. O. Kenyon, to Eastman Kodak.

Organic ester, cell. with ester of trichlorotertiary-butyl alcohol. No. 1,946,643. H. B. Smith, to Eastman Kodak.

Oxidizing compound, dried acetate acted on by gas. No. 1,946,645. C. J. Staud & T. F. Murray, to Eastman Kodak.

Synthetic lumber from cornstalks, copper sulfate treated against mold. Nos. 1,946,952-3. R. Sweeney, to Iowa College of Agriculture, Ames, Iowa.

Composition from cell. derivative, ester of halogenated fatty acid and polyhydric alcohol. No. 1,947,008. E. F. Izard, to du Pont Co., Wilmington.

Method and process for cellulosic absorbent felt. Nos. 1,947-103-4-5-6. J. E. Plumstead, Wilmington, to Jessup & Moore Paper Co., Philadelphia.

Cellulose esters and the mfr. of new cell. derivatives. Nos. 1,947,463-4. Henry Dreyfus, London.

Copper oxide-ammonia cell. solutions. No. 1,947,939. E. Hubert & K. Weisbrod, to I. G. F., Frankfort.

For increasing tensile strength of cell. and product. No. 1,948,276. A. J. Pacini, Chicago, to Milprint Prod. Corp., Milwaukee.

Chlorine liberating solution to improve organic substitution derivative of cell. No. 1,948,517. C. Dreyfus & G. Schneider to, Celanese Corp.

Precipitation and treatment of cell. derivatives. No. 1,948,625. D. B. Mason, to U. S. Ind. Alcohol Co., N. Y.

Process for improving unstable acyl celluloses. No. 1,948,903. E. Correns & A. Mohring, to I. G. F., Frankfort.

Steeping compact cell. sheets in progressive nitric acid bath to produce nitrocellulose. No. 1,948,944. M. O. Schur, Berlin, N. H., to Brown Co.

Fibrous composition and process. No. 1,949,249. H. C. Fisher, to The Richardson Co., Lockland, O.

Corrugated board with asphalt: heat and pressure. No. 1,949,255. C. L. Keller, to The Richardson Co., Lockland, O.

Cell. composition and method of plasticizing. No. 1,949,434. G. Schneider, to Celanese Corp.

Production and treatment of materials derivative from cellulose. No. 1,950,024. H. Dreyfus, London.

Rapidly seasoned cell. acetate film base. No. 1,947,419. M. Marasco, to Dupont Film M'fg Corp.,

Coatings

Method of dissolving shellac and rosin in alcohol for lacquers. No. 1,945,584. A. Williams, Buenos Aires to Swift & Co., Chicago.

Coating composition, non-volatile material and liquefied gas with hydrocarbon radical. No. 1,945,998. E. Rotheim. Oslo, Norway.

Nitrocellulose coating containing an acid body. No. 1,946,479. T. F. Bradley, to Ellis-Foster Co., Montclair, N. J.

Cell. acetate-phosphoric acid lacquer for copper. No. 1,946,647. E. R. Taylor & H. I. Davis, to Eastman Kodak.

Highly acid titanium dioxid-sulfuric acid solutions for pigments. No. 1,947,226. H. W. Richter, Elizabeth, N. J.

Oxidized drying oil with phenol and aldehyde, and alkaline catalyst, for high solubility coating. No. 1,947,414. A. Heck, to Cook Paint & Var. Co., Kansas City, Mo.

Coating composition, of drying oil, phenol and natural resin. No. 1,947,415. A. Heck, to Cook Paint & Var. Co., Kansas City.

Plastic adhesive metal coating. No 1,790,643. Disclaimer filed by Assignee, Gulf Research & Dev. Corp.

Opaque film resistant to chalking. No. 1,948,580. R. T. Hucks, to du Pont Co., Wilmington.

Drying oil, catalyst and creosol as antioxidant coating composition. No. 1,948,582. J. K. Hunt & G. H. Latham, to du Pont & Co., Wilmington.

Solidified oxidized and polymerized drying oil in aqueous vehicle. No. 1,948,959. M. Croce, Pa., to Sloane-Blabon Corp., N. Y.

"Woodcraft" trade-mark for enamels, lacquers, paints, etc. No. 345,682. Sherwin-Williams Co., Cleveland.

Process for coating the surfaces of pigments. No. 1,946,052. J. T. Baldwin, Pa., to Sandura Co., Paulsboro, N. J.

Formaldehyde

The production of readily soluble paraformaldehyde from formaldehyde. No. 1,948,069. O. Fuchs & E. Naujoks, to Deutsche G. & S. vormals Roessler, Frankfort.

Process for acetic acid from formaldehyde. No. 1,950,027. S. J. Green & R. Handley, Eng., to Celanese Corp., N. Y.

Condensation product—formaldehyde and ammonium thiocyanate. Soluble in acetone. No. 1,945,315. R. A. Jacobson, to du Pont Co., Wilmington.

Laminated

Mechanism for heat-treatment of laminated bodies. No. 1,945,412. F. H. Benge, to Cont. Diamond Fibre, Newark, Del.

Method and apparatus for producing segmental rims. Nos. 1,945,413-4. F. H. Benge, to Cont. Diamond Fibre Co., Newark, Del.

ADVERTISER'S INDEX

	Page
American-British Chemical Supplies, Inc.	142
American Catalin Corp.	121
American Cyanamid & Chemical Corp.	Cover 4
American Plastics Corp.	144
American Record Corp.	148
Auburn Button Works, Inc.	148
Bakelite Corporation	124
Baker Perkins Co. Inc.	146
Bay State Moulding Co., Inc.	158
Becker-Moore Co.	150
Boonton Molding Co.	158
British Plastics	154
Brooklyn Color Works, Inc.	158
Burr Chromium Co.	158
Carver, Fred S.	152
Cavagnaro, John J.	148
Chemical Industries	Cover 3
Chicago Molded Products Corp.	154
Claremont Waste Mfg. Co.	156
Commercial Solvents Corp.	125
Compo-Site, Inc.	158
Consolidated Products Corp.	156
duPont de Nemours & Co., E. I.	156
Eagle Tool & Machine Co.	158
Esselen, Gustavus J., Inc.	152
General Electric Co.	126
General Plastics, Inc.	128
Gering, Larry, Inc.	158
Hercules Powder Co.	152
Heveatex Corp.	158
Heyden Chemical Co.	146
Imperial Molded Products Corp.	154
Kuhn & Jacob Molding & Tool Co.	152
Makalot Corp.	144
Marblette Corp.	123
McGraw-Hill Pub. Co.	150
Monsanto Chemical Co.	160
National Aniline & Chem. Co., Inc.	142
Newark Die Co.	156
Plastics Guide Book	Cover 2
Shaw Insulator Co.	150
Standard Tool Co.	154
State Chemical Co. Inc.	156
Tennessee Eastman Corp.	127
Uhlich, Paul, & Co.	160
United Rubber Machinery Exchange	160
Waterbury Button Co.	154

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